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CLINICAL APPLICATION OF THE PARAFFIN BATH *

WALTER J. ZEITER, M.D.

Cleveland Clinic

CLEVELAND, OHIO

In 1892 Barthe de Sandfort expressed the opinion that paraffin dressings are of clinical value, and in 1915,[1] he published his experiences, technic, and indications for treatment with paraffin. At that time the chief interest in this substance was centered about its value in the treatment of burns. De Sandfort, however, was using it for the relief of rheumatism, gout, sciatica, and other diseases. The formula of the preparation he introduced was kept a secret, but it was later disclosed that it was a mixture of paraffins at various melting points to which pine needle oil was added.

Paraffin has been more generally used in Europe, especially in the form of packs. By this method a relatively high temperature of the substance is tolerated by the skin. It is applied at temperatures as high as 167 F. (75 C.). Lampert[2] who measured the actual temperature of the paraffin when applied to the skin found that the beginning temperature of his melted paraffin was from 172 (77.8) to 177 F. (80.6 C.). After a few seconds the temperature dropped to 131 (55), after two minutes to 111 (43.9), and after five minutes to 106.7 F. (41.4 C.).

A temperature of 130 to 136 F. (54.4 to 57.8 C.) is readily tolerated by the skin when paraffin is applied, although it is well known that a water bath of this temperature would burn the skin. As Lampert explains this tolerance, it is possible that through the high temperature, a heat-insulating layer of water vapor is formed between the skin and the paraffin, thereby preventing the high temperature compound from coming into direct contact with the skin.

Vontz[3] illustrates the therapeutic value of paraffin on the following physical basis:

Water:	Specific heat = 1.0; temperature tolerated: 45 C.	
	Heat Content: (45-37) x 1.0 = 8000 Calories	
Paraffin:	Specific heat = 0.7; temperature tolerated 55 C. and higher	
	Heat Content: (55-37) x 0.7 = 12,600 Calories	
	+ Melting Heat	35,000 Calories
		47,600 Calories

From these figures it can readily be noted that the quantity of heat available from paraffin is six times that of water.

In further studies, Vontz calculated the heat content available between tolerance and body temperature for sand, fango, and paraffin, and he found a ratio of 2470 to 7100 to 47,600 calories per kilogram respectively.

Sand:	Specific heat: 0.19; temperature tolerated: 50 C.	
	Heat Content: (50-37) x 0.19 x 1000 = 2470 cal./kg.	
Fango:	Specific heat: 0.71; temperature tolerated: 47 C.	
	Heat Content: (47-37) x 0.71 x 1000 = 7100 cal./kg.	
Paraffin:	Specific heat: 0.7; temperature tolerated: 55 C.	
	Heat Content: (55-37) x 0.7 x 1000 = 12,600 cal./kg.	
	+ Melting heat	35,000 cal./kg.
		47,600 cal./kg.

Here again, the melting heat inherent in the paraffin increases the total amount of heat available.

* Read at the Seventeenth Annual Session of the American Congress of Physical Therapy, Chicago, September 13, 1938.

In a study to determine the rate of cooling under identical conditions, these three substances were heated to 167 F. (75 C.) and subsequently placed in an incubator at 98.6 F. (37 C.). The times of cooling for these substances were:

Sand	120 minutes
Fango	160 minutes
Paraffin	380 minutes

If the calories available per minute are calculated, these figures are as follows:

TABLE 1. — *Calculated Calories Available Per Minute.*

	Temp.-Diff.	Cooling Time	Cal./Min.
Sand	50-38°	90 min.	25
Fango	47-38°	90 min.	71
Paraffin	55-52°	5 min.	420
	52-38°	300 min.	149
	(55-43°	90 min.	482)

The temperature of the melted paraffin can easily be determined, but there is the question of what is the temperature of the skin after the paraffin becomes congealed on the hand or foot? To answer this, we have made temperature determinations by means of a constantan copper thermocouple used in connection with a sensitive galvanometer. In the usual manner, three to five layers of paraffin were allowed to congeal on the hand. Readings were made, keeping the hand immersed and also keeping it outside of the bath. The temperature of the paraffin varied between 130 (54.4) and 136.4 F. (58 C.). In the first series the paraffin "glove" was applied and then the hand was kept immersed in the paraffin. After the galvanometer became fairly stable, it was found that the skin temperature averaged about 116 F. (46.7 C.).

In the second series, the "glove" was applied and the hand was kept outside the bath. At one minute the temperature averaged 120 (48.9); at five minutes, 110 (43.3); at ten minutes, 105 F. (40.6 C.); after this temperature is reached the heat loss is slow.

From these determinations it will be noted that if the maximum amount of heat is desired, it is necessary to keep the extremity immersed in the bath after the congealed layers are formed.

During the World War paraffin was employed extensively, various baths having been designed and built for use in the base hospitals. It was during this period that James A. Dickson of our Orthopedic Department had the opportunity to evaluate the benefit derived from the use of paraffin, especially in the rehabilitation of the soldiers who had sustained injuries to the extremities. Several years later, he introduced the paraffin baths in our physical therapy department where they have been utilized for 15 years. In the last eight years, more than 9,000 treatments have been given as the hand and foot baths.

Technic

In order to avoid the gas flame formerly used for melting the paraffin, Humphris[4] in 1920, described a bath that was electrically heated, the bath itself being made of fire clay. In 1926 Portmann[5] described a metal bath that was electrically heated. From this was developed the unit we use at the present time. The inside of such a bath is constructed of stainless metal, and the outside casing is of chrome plated steel. Built in the walls and the base are the melting and maintenance elements, respectively, which are insulated by firmly packed mineral wool. To protect the patient's extremi-

ties from touching the heated metal, slats of bakelite or wood fastened to strips of stainless metal are placed on the bottom of the appliance. The melting and maintenance elements are controlled by a time switch and a thermostat. If the paraffin is congealed, the melting element is used until the paraffin is nearly at the operating temperature, then the maintenance element, independent of the melting element, keeps the bath at the desired temperature.

Ordinary commercial paraffin is used. The melting point may range from 123 (50.6) to 136 F. (57.8 C.). If the melting point is too high, it can readily be lowered by the addition of paraffin oil. A melting point up to 130 F. (54.5 C.) is usually tolerated and is not felt as too warm by the patient. In our baths the melting point is maintained at about 126 F. (52.2 C.). On one occasion a hand was immersed in the paraffin when the temperature was nearly 160 F. (71.1 C.). The bath felt too hot to keep the hand immersed but no injury or burn resulted.

Before immersing the extremity to be treated, it is washed and carefully dried. Then the patient dips the member in and out of the bath quickly so that a thin coating of paraffin congeals on the skin. This is repeated several times until the glove of paraffin is of sufficient thickness to allow the part to remain in the bath with comfort. The patient keeps the extremity immersed in the bath from ten minutes to half an hour. Then the glove of adherent paraffin is removed and replaced in the bath, following which massage and re-education of the muscles are instituted. The skin always remains soft, pliable, and moist when this procedure is employed; it is not withered and shriveled as it is from contact with water. Marked hyperemia results.

Paraffin may be used not only in the hospital and office but also in the home. For this purpose we have employed a double boiler very successfully, giving the patient the following instructions:

Hands. — Fill the top part of a large double boiler (6 quart) with paraffin (6 to 8 pounds) and the lower part with hot water. Heat until almost all the paraffin is melted but be sure an unmelted piece remains. This is important if burns are to be avoided. Remove from the fire, leaving the water in the bottom of boiler.

Dip the hand quickly into the paraffin, keeping the fingers separated and being careful not to touch the sides or bottom of the boiler. Remove the hand from the boiler until the paraffin hardens on the hand, then dip and quickly remove again. Repeat this procedure until a thick "glove" is formed, after which the hand is kept immersed in the paraffin for ten minutes to half an hour. Peel off the glove and put the paraffin back into the boiler.

If exercise is prescribed, squeeze and mold a piece of warm paraffin in the hand before putting it back in the boiler.

It is well to have a thermometer to check the temperature of the paraffin, although this is not essential as will be noted from the above directions. If an unmelted piece of paraffin remains or if the paraffin is allowed to cool until it begins to congeal on the surface, it will be perfectly safe to use.

The paraffin can also be used on the body surface when other forms of heat are not available. For this purpose the paraffin is melted, a clean, warmed paint brush is immersed in it, and the part to be treated is painted rapidly with about a dozen coats of the liquid paraffin. When the paraffin is first applied to the skin, it will feel very warm. This thick coating which retains its own heat for a considerable period is allowed to remain on the area for twenty to thirty minutes. This simple method, can also be made available for home use.

Indications

Paraffin may be used whenever a local form of heat is desired. Because of its simplicity of application, it is especially adaptable for the hands and feet. Excellent results have been obtained in treating arthritis. In most instances it is well tolerated, gives a soothing feeling and produces relief of pain. After its removal, it leaves the skin oily, which is very suitable for massage. In most instances the paraffin bath is used daily in the arthritic, followed by massage and exercise if indicated. It is also effective in stiffness of joints following lacerations or infections, in the treatment of scars restricting motion of joints and tendons, in involvements of joints secondary to lesions of nerves, in sprains, and in contusions. In other conditions, such as fibrositis of the lumbar area, it can be applied with a paint brush as described above.

Because of the marked heat, the paraffin bath must be used judiciously in old, weak, and debilitated individuals. If circulatory and sensory changes are present, paraffin should be used with caution because of the danger of burns. Open wounds, cuts, and infections of the skin are better treated by other methods. If the ordinary precautions mentioned above are taken, burns will be avoided. Repeated use of the paraffin locally in some patients may rarely produce a mild erythema *ab igne*.

The objection has been made that the paraffin bath is less sanitary than other procedures. Cultures made from the baths have been positive when taken immediately after use. After standing for some time before cultures were again taken, no growth resulted. With the ordinary precaution of cleaning out the tank, using new paraffin, insisting that each extremity be bathed before the bath is used and if open wounds, cuts, and skin infections are treated by other means, this objection becomes negligible.

Summary

The paraffin bath affords a simple and efficient method of applying heat.

After the application of the paraffin, the skin remains soft and pliable and in excellent condition for massage.

No unusual value is attributed to the paraffin except its heating properties.

It is simple to operate and maintain and the cost of upkeep is low.

It is available for use in the home.

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Discussion

Dr. Paul Roth (Battle Creek): Dr. Zeiter presents very definitely the chief therapeutic properties of the paraffin bath. It very clearly establishes its surprisingly high amount of available heat as compared to that of water when either of these agents is applied within the limit of skin tolerance.

The most important property of paraffin which, with certain limits, makes its safe application to the skin possible at relatively high temperatures is its low thermal conductivity whether melted or more or less solidified. Besides this, when applications of heat are made by means of any agent such as air, sand, water, clay or mud, oil or paraffin, radiothermy, diathermy and short wave induction, protection

(*Concluded on page 493*)

Symposium on Electroresection

RECENT DEVELOPMENTS IN TRANSURETHRAL PROSTATECTOMY *

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Section on Urology, The Mayo Clinic

ROCHESTER, MINNESOTA

Since the beginning of the science of medicine the surgical problem presented by obstruction of the neck of the bladder in the male has been of distinct interest. A satisfactory solution of this problem was not forthcoming until the early part of the twentieth century, at which time suprapubic and perineal prostatectomy became standardized procedures. Owing to technical reasons the suprapubic operation was more widely used. Because of the severity of the operation, the long confinement in the hospital, the prolonged morbidity and the high mortality, it has remained an operation of necessity rather than an elective procedure. This situation has been created not by the surgeon, but by the patient. In most cases the patients chose such a procedure only when they felt that they would surely die unless something radical were done to relieve them. The result of this psychology was that a very large percentage of patients seen by the prostatic surgeon were those who had allowed the urinary obstruction to proceed unrelieved for long intervals. By the time they came for operation they were extremely poor surgical risks, owing to marked renal infection and insufficiency, severe anemia and general debility. This type of patient of necessity increased the operative mortality rate and a vicious cycle was instituted. The higher the operative risk, the less inclined was the patient to submit to operation when necessary. No wonder that the medical student's picture of a patient suffering from prostatism was that of a moribund old man who had a chronically distended bladder, foul urine, marked pyonephrosis with extreme renal insufficiency, and a severe nephritic anemia. This represents the end stage of prostatism and may be compared to the end stages of other neglected conditions, such as appendiceal abscess, thyroid crisis, ulcerating malignancy of the breast and tertiary syphilis. The problem was to devise a method of treatment which the patient would accept for relief before the condition had progressed to its terminal stages.

Transurethral Resection

The answer to this therapeutic problem has been found in transurethral prostatic resection. This operation has greatly lowered the mortality and morbidity rate incident to the relief of prostatic obstruction. The period of hospital confinement also has been dramatically reduced and is now but a matter of a few days instead of several weeks. These important advances have dispelled the fear of prostatic operation and it now becomes an elective procedure. The medical instructor of the next generation will probably have difficulty to find patients in the terminal stages of prostatism to demonstrate to his students.

That this statement is true is evidenced by the fact that at The Mayo Clinic during the five years, 1926 to 1930 inclusive, an average of 255 patients a year were subjected to suprapubic or perineal prostatectomy, while during the years 1933 to 1937 inclusive, an average of 661 patients a year were sub-

* Read at the Seventeenth Annual Session of the American Congress of Physical Therapy, Chicago, September 13, 1938.

jected to transurethral prostatic resection. During the year 1937, 826 resections were performed on 782 patients. It is of interest that in the five years of 1926 to 1930, only 20.4 per cent of the 1274 patients subjected to suprapubic or perineal prostatectomy were seventy or more years of age, and that only 1.02 per cent of the patients were past eighty or more years of age. In the corresponding group of 3307 cases in which transurethral resection was performed in the five years of 1933 to 1937, 33.6 per cent of the patients were seventy or more years of age, and 4.2 per cent were eighty or more years of age (table 1). In spite of the larger number of patients in the advanced age

TABLE 1. — *Patients of Various Ages Who Underwent Prostatectomy (Suprapubic and Perineal) From 1926 to 1930 Inclusive and Other Patients of the Same Ages Who Underwent Transurethral Prostatic Resection From 1933 to 1937 Inclusive.*

		1926		1927		1928		1929		1930			
	Age group, years	Patients	Per Cent	Patients	Per Cent	Patients	Per Cent	Patients	Per Cent	Patients	Per Cent	Total	Per Cent
Prostatectomy	Under 70	197	79.8	206	79.8	221	83.4	207	76.4	183	78.6	1014	79.6
	70-79	49	19.8	50	19.4	43	16.2	59	21.8	46	19.7	247	19.4
	80-89	1	0.4	2	0.8	1	0.4	5	1.8	4	1.7	13	1.0
	90-99	0		0		0		0		0		0	
	Total	247	100	258	100	265	100	271	100	233	100	1274	100
		1933		1934		1935		1936		1937			
Transurethral resection	Under 70	299	66.2	438	69.6	449	64.6	490	65.4	520	66.5	2196	66.4
	70-79	137	30.4	176	27.9	208	30.0	218	29.2	233	29.8	972	29.4
	80-89	14	3.2	16	2.5	37	5.3	40	5.3	29	3.7	136	4.1
	90-99	1	0.2	0		1	0.1	1	0.1	0		3	0.1
	Total	451	100	630	100	695	100	749	100	782	100	3307	100

groups the mortality rate for the transurethral operation has been astonishingly low, as shown in table 2. The average postoperative confinement in the

TABLE 2. — *Mortality Rate of Transurethral Prostatic Resection for the Five Years 1933 to 1937 Inclusive.*

Year	Patients	Resections	Deaths	Per cent of patients	Per cent of resections
1933	451	513	5	1.1	1.0
1934	630	696	2	0.3	0.3
1935	695	765	7	1.0	0.9
1936	749	835	11	1.5	1.3
1937	782	826	18	2.3	2.2
Total	3307	3635	43	1.3	1.2

hospital remains constant year after year, at about eight days.

There is probably no better way of illustrating the present trend of transurethral resection than to summarize briefly our experience with this procedure at the clinic since it first assumed importance in 1931. Three main types of instruments are employed. One type consists of a loop of wire activated with a high frequency cutting current. An example of this is the Stern-McCarthy resectoscope. The second type of instrument consists of a cold cutting tubular knife running in an outer fenestrated sheath. Subsequent bleeding is controlled by fulguration of each bleeding vessel with a Bugbee electrode. Examples of this type are the Young punch, the Braasch median bar exciser, the Braasch-Bumpus resectoscope, and the Thompson resectoscope. The third type of instrument is much like the second except

that the tubular knife is heated sufficiently to become a live cautery which controls bleeding as the incision is made. The Caulk cautery punch is an instrument of this type.

In our early experience at the clinic all of these types of instruments were used. Because there seemed to be much less postoperative reaction, less elevation of temperature and a smoother convalescence when the cold cutting punch type was used, the Braasch-Bumpus resectoscope was adopted (fig. 1). Since those early days all instruments have been greatly improved.

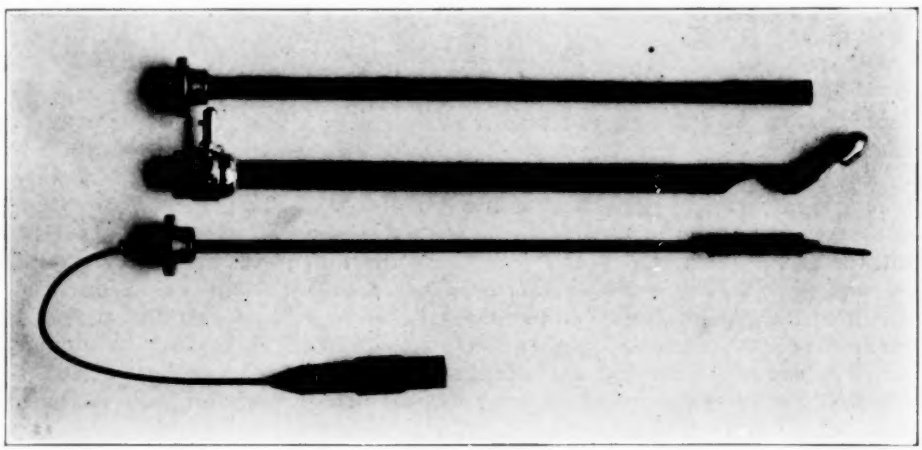

Fig. 1. — Braasch-Bumpus resectoscope.

We still use the cold cutting tubular knife type for the same reason for which we originally adopted it, but we now use the Thompson resectoscope. We realize, however, that most excellent results are being achieved with other types of instruments and feel that the most important advice to the beginner in the art of resection is to decide on one type of instrument and master the technic of its use. Any of these modern instruments, when used expertly, will produce very satisfactory results, but there are few men who can become expert with several types.

One of the outstanding departures from the previous orthodox methods for the care of the prostatic patient is the preoperative preparation. Early in our experience it became apparent that the routine preliminary period of catheter drainage so carefully followed in suprapubic prostatectomy was not only unnecessary but often harmful. We finally laid down the rule that catheter drainage should not be instituted except when the concentration of urea became greater than 60 mg. per 100 cc. of blood. We now terminate catheter drainage as soon as the concentration of urea is 50 mg., or less, per 100 cc. of blood. The only other cases in which an indwelling catheter is used are those in which complete urinary obstruction is present when the patients are admitted to the hospital and an indwelling catheter is necessary for comfort during the one or two days required to complete the general examination. As far as preliminary suprapubic drainage is concerned, its use has been gradually limited and at present is rarely employed. For instance, during the last year (1937) we performed preliminary suprapubic cystostomy in only 6, or 0.8 per cent of the cases in which transurethral prostatic resection was performed. When drainage is necessary because of retention of nitrogen we much prefer to use the urethral catheter, even if it is necessary to continue this type of drainage for as long as two weeks. In cases in which severe renal injury is present and the concentration of urea

cannot be reduced below 100 or 150 mg. per 100 cc. of blood, we formerly would have considered it proper to perform a suprapubic cystostomy and send the patient home for several weeks or months to allow drainage. Through experience we have found that transurethral operation may be performed safely in such cases if the resection is rapidly and well performed; in fact, the risk of a transurethral operation is considerably less than that involved in suprapubic cystostomy. During the last few years transurethral prostatic resection has been performed in a considerable number of cases in which the concentration of the blood urea was greater than 100 mg. per 100 cc. at the time of operation.

Technic of Resection

The technic of resection also has undergone considerable change in recent years. It was first felt that it was necessary only to cut a gutter or channel through the prostatic urethra. This was soon found to be entirely inadequate. Later, it was felt that it was necessary to resect only the median lobe and intravesical projection of the lateral lobes. The results of this type of resection also were unsatisfactory. It then became apparent that all of the intravesical tissue and as much of the intra-urethral tissue as possible should be removed. This type of resection produced excellent results. In a few cases in which the patients returned to the clinic in one or two years because of a recurrence of obstructive symptoms it was found that an insufficient amount of tissue had been removed at the first operation. It, therefore, became apparent that transurethral resection must approach total prostatectomy to insure satisfactory and permanent results.

The problem of performing a complete prostatectomy by the transurethral route at first presented some difficulties. For instance, it has been definitely shown that in cases in which the patients are men of advanced years, the operative period should not be longer than fifty or sixty minutes. When this rule is violated complications become more frequent and the mortality rate is definitely increased. Therefore, when a large prostate gland is encountered, if one wishes to approach a total removal of the gland by resection one must have instruments capable of removing tissue rapidly. With the Braasch-Bumpus resectoscope, except in rare cases, 30 to 45 gm. of tissue is about all that can be removed in fifty to sixty minutes by an experienced surgeon. In cases in which the prostate gland is moderately large, the removal of this amount of tissue very often produces excellent functional results and the patient cannot see the need of a second resection to remove the remaining tissue. In most of these cases the result is excellent but in a small percentage of cases bleeding occurs intermittently from the remaining adenomatous tissue and the patients return later because of a recurrence of the obstructive symptoms.

This handicap has been remedied by the development of the Thompson resectoscope (fig. 2). This instrument retains the basic features of the cold cutting tubular knife in the Braasch-Bumpus resectoscope, but allows rapid cutting under vision. The use of this instrument reduces the technical steps that are required to remove each piece of tissue and the pieces of tissue drop into the bladder to be subsequently washed out through the large outlet valve. As a result, from 50 to 80 grams or more of tissue may be very easily removed in forty-five to sixty minutes. With this increased speed of resection it is possible to approach prostatectomy in a high percentage of cases with one resection. In addition to facilitating the removal of larger amounts of tissue, this instrument is much easier for the surgeon to use than the Braasch-Bumpus resectoscope and enables one to resect accurately at the apex of the prostate gland without endangering the external sphincter. With

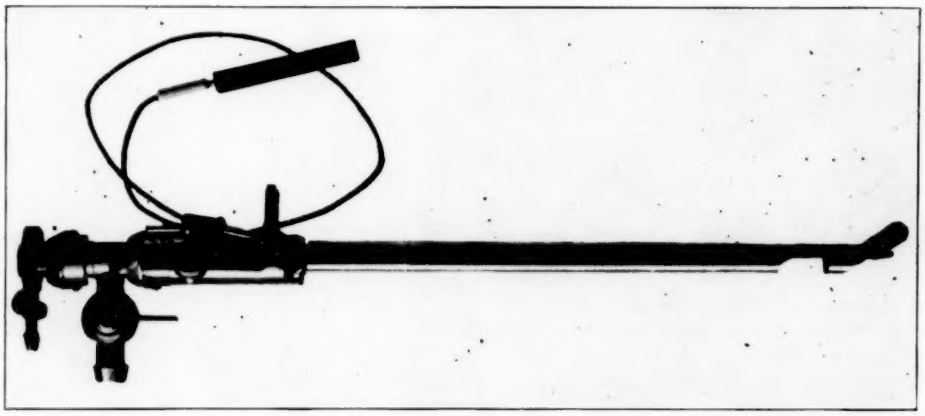

Fig. 2. — Thompson resectoscope.

the Bugbee electrode incorporated in the instrument and ready for instant use, the tendency is to fulgurate bleeding vessels more promptly and thereby reduce loss of blood.

As all of the adenomatous tissue usually is resected and only the surgical capsule of the prostate gland is left, bleeding points are more easily seen and controlled by fulguration. Delayed postoperative bleeding (that nearly always arises from remnants of adenomatous tissue) has been almost entirely eliminated. One word of warning must be sounded, the surgeon must accurately identify the capsule of the prostate gland and not cut into it too deeply. If one cuts deeply into the capsule, troublesome venous bleeding will occur from the venous plexus. At times, this bleeding may be most difficult to control. It manifests itself in "sheet bleeding" that wells up between the coarse fibers of the prostatic capsule. This bleeding often is only increased by continued fulguration and the pocket from which the blood is flowing is deepened. As the bleeding is readily controlled by pressure, the use of the hemostatic catheter bag is the treatment of choice. At the clinic, we have never yet found it necessary to perform a suprapubic cystostomy for the control of hemorrhage.

Every surgeon who has attempted transurethral operation on the prostate gland has sooner or later encountered difficulty in removing intra-urethral lateral lobe tissue at the apex of the prostate gland when the prostatic urethra is deeply "pocketed." To remove this tissue successfully, it is imperative that all of the tissue of the anterior portion of the lateral lobes should be removed first. Following this, digital counterpressure in the rectum by an assistant will elevate the remaining adenomatous tissue, so that it may be easily engaged and removed. If the tissue of the anterior portion of the lateral lobes is not removed first, the rectal counterpressure may be of little or no value. We now employ digital counterpressure in a large percentage of cases. In addition to facilitating the removal of tissue it prevents excessive trauma of the trigon and external sphincter.

The results of this more thorough removal of prostatic tissue are most gratifying. Convalescence is smooth and the urinary infection is rapidly eradicated. The necessity of a "secondary," or "two-stage," resection is rapidly diminishing. For instance, during the years we employed the Braasch-Bumpus resectoscope a second resection was performed in about 10 per cent of cases before the patients were dismissed from the hospital. That percentage has now dropped to considerably less than 5. The average patient, even after the resection of a large prostate, has little or no urinary frequency

during the day and has to micturate only one to three times at night during the first few days after the removal of the catheter. By the fourteenth postoperative day, the nocturia usually has disappeared or the patient is voiding not more than once during the night. It is not at all uncommon to find that the urine is normal microscopically when patients are seen six weeks after the operation. If some infection persists in the urine after this time, the administration of 40 grains (2.6 Gm.) of sulfanilamide daily for a week or ten days will eradicate it in most cases. It is useless to administer sulfanilamide prior to this time, however, as it seems to be of no value until the prostatic bed has healed.

The question often arises as to what proportion of the prostate gland is removed at transurethral operation. During the year 1937, 782 patients were subjected to transurethral resection. The average weight of tissue removed in each case during this period was 23.1 Gm. During the years from 1912 to 1931, inclusive, prostatectomy, either suprapubic or perineal, was performed at the clinic in 3,629 cases. We have records of the weight of the tissue removed in 3,205 cases and in this group the average weight was 44.1 Gm. (fig. 3).

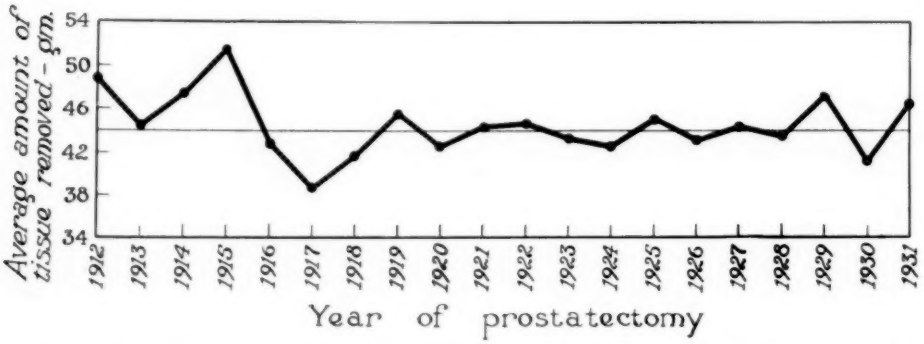

Fig. 3. — Graph showing average weights of prostatic tissue removed by means of suprapubic or perineal prostatectomy during the years 1912 to 1931, inclusive.

This comparison is not fair to transurethral resection, however, as the group of cases in which resection was performed includes those in which the operation was performed because of median bars and contractures of the vesical neck. Formerly, the patients in these cases would not have been subjected to the risk of prostatectomy. In an effort to make a more fair comparison we might eliminate all of the cases in which 10 Gm. of tissue or less was removed at resection. This would automatically eliminate the cases of median bars and contractures of the vesical neck. If we eliminate all of the cases in which the weight of tissue removed was 10 Gm. or less (200 cases) the average weight of tissue removed at resection during 1937 is 30.8 Gm. These figures suggest that a much larger proportion of the gland is being removed than is generally supposed. Much has been written concerning the incidence of large prostate glands. It is an interesting observation that of the 3,205 prostate glands that were removed suprapubically or perineally at the clinic between 1912 and 1931, only 7.3 per cent weighed more than 100 gm.

The distressing complications recorded in the early literature of transurethral resection simply represent the mistakes and accidents incident to the learning of a new and extremely technical surgical procedure. The complications now observed should be those routinely expected to result in a similar group of cases in which any type of surgical procedure is used. These complications are pulmonary embolism, vascular accident, pneumonia and

acute postoperative infection; an unexplained streptococcic septicemia occurs occasionally. Excessive hemorrhage at or immediately following resection should be carefully avoided as it predisposes to these complications. When such bleeding is encountered the surgeon should not hesitate to return the patient to the operating room, evacuate the blood clots, and fulgurize the bleeding points. Judicious and prompt blood transfusion in such a case is extremely valuable if a considerable amount of blood has been lost. When it is necessary to return a patient to the operating room for control of hemorrhage, the anesthetic of choice is pentothal sodium administered intravenously.

Complications

The incidence of postoperative urethral stricture has been much discussed and has been a real problem in transurethral surgery. I estimate that this incidence is 1 to 1.5 per cent in more than 3500 cases in which transurethral prostatic resection has been performed at the clinic between 1931 and 1938. Such an estimate is difficult to make as there are no doubt, cases in which postoperative stricture develops but never becomes troublesome enough for the patient to seek relief. Most of these strictures are of little significance and readily respond to one or two dilatations. Occasionally, one is encountered that cannot be dilated. This type of stricture is usually found in the anterior urethra, most often in the region of the penoscrotal angle. Internal urethrotomy with the Riba high frequency urethrotome[4] gives satisfactory results in most of these cases and carries little if any surgical risk.

The most important part of the subject of postoperative urethral stricture is its etiology and prevention. The foremost etiologic factor, no doubt, is the passing of too large instruments through the urethra. Other important causes are the trauma produced by the backward and forward motion of the instrument in an insufficiently lubricated urethra and prolonging the operation. When the McCarthy instrument is employed the factor of allowing the sheath of the instrument to become too hot must be considered. To obviate this difficulty, the operation of perineal prostatic resection as suggested by Cabot and Thompson has been successfully employed.[1, 2, 5, 6] This procedure makes use of the fact that the bulbous perineal urethra is of large caliber. By making an external urethrotomy incision in the perineal urethra, over a grooved sound, and introducing the resectoscope through this incision into the bladder, the prostatic resection may be carried out very easily in cases in which the caliber of the urethra is small. This technic should be used in all cases in which the urethra does not easily admit the resectoscope. After the resection, a urethral catheter is introduced into the bladder as usual through the penile urethra. The perineal incision does not have to be sutured. The wound is usually completely healed by the time the catheter is removed on the third or fourth postoperative day. Nesbit[3] has recently advised this method in cases in which the prostate gland is large. A larger caliber resectoscope may then be employed which will permit larger pieces of tissue to be removed. This procedure will no doubt prove to be one of the major advances in this line of work.

Because of the ability of the surgeon to perform a complete enucleation of the prostate gland when necessary, and to approach prostatectomy routinely, transurethral resection in the future will be spoken of as transurethral prostatectomy. The trend is definitely to remove larger amounts of tissue. The results, therefore, will be permanent, and equal to if not better, than the results of enucleation by the suprapubic or perineal route. Because any type of prostate gland may now be successfully removed transurethrally, there will be little indication in the future for any type of open operation in prostatic obstruction.

Summary

Transurethral prostatic resection has changed the surgical relief of prostatic obstruction from an operation of necessity to one of election. This is due to the dramatic lowering of the mortality and morbidity rates and length of postoperative hospital confinement. The newer trend in resection is to remove larger amounts of tissue approaching a complete prostatectomy. This more complete operation makes for a smoother and more rapid convalescence. The results are permanent and better than those obtained with the older operations of total enucleation. Transurethral prostatic resection is to become transurethral prostatectomy.

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Discussion

Dr. W. L. Sherman (Eloise, Mich.): I am very much impressed by the presentation of so large a series of cases of prostatic obstruction which were relieved by a single method, namely transurethral resection. It has also been responsible for considerable self interrogation, inasmuch as it had not been my best judgment to limit myself to one method for the relief of this distressing complaint. I am most grateful for the resectoscope because of the opportunity for relief it offers the patient with small residual urine, and that with a minimum of troublesome sequelae. I am also grateful that it is not the only method I have to offer to my patients for the relief of prostatism. In earlier times we would hesitate to suggest open operation to this type of patient, and with exception of a few cases this type of surgery was carried out only in patients with a residual urine in excess of 2 ounces.

I recognize in transurethral resection a method of affording relief to a larger number of patients than open operation formerly allowed. However in my experience it has not tripled the volume of cases in which I have offered surgical relief. I wish Dr. Emmett had outlined more clearly whether, since the advent of transurethral resection, there had also been any change in indication for operation.

Dr. Emmett very ably described a moribund old man with a chronically distended bladder, foul urine, marked pyonephrosis, renal insufficiency and severe anemia. That in earlier days was the medical student's picture of a patient suffering from prostatism. Times may have changed, but in Detroit we still have patients who present that picture. They are referred to a urologist only after the urethra has been traumatized by repeated attempts at catheterization usually with a steel catheter. So much edema exists that even a filiform bougie cannot be passed. I feel certain that this type of patient who comes under my care is physically unable to be transported any great distance before obtaining relief. They constitute emergencies.

This may possibly account for the fact that the group who are able to present themselves at the Mayo Clinic may not include cases advanced to the point which has been so aptly described. This type of patient must be managed very carefully in order that he may withstand any type of surgery. Many of these patients are so grossly infected that they cannot tolerate even a catheter. It is my experience that the only procedure I can offer that type of patient with any hope of safety is suprapubic drainage. This class of patients easily constitutes 15 per cent of prostatics seen in Detroit. Even with this hazardous group the mortality rate is sufficiently low to be gratifying, and I can offer surgical drainage to them with an easy conscience.

May I at this point ask Dr. Emmett which type of prostatectomy he refers to that carries a high mortality rate? If he is referring to one-stage prostatectomy, I can agree with him to the extent that I believe one-stage prostatectomies should *never* be done. However, if he is referring to the perineal or the two-stage suprapubic prostatectomy, no. It is my belief that the mortality rate obtained in this type of surgery compares very favorably with published rates obtained by transurethral resection. It is also my experience that the morbidity is not any shorter with transurethral surgery than with open operation, in spite of the aid offered by the newer urinary antiseptics. A shorter hospitalization period does not necessarily mean a short morbidity

period. Personally I have never felt that transurethral resection had sufficient advantages over open operation, in certain types of obstruction, to warrant my discarding finger enucleation altogether. And while it is a procedure that has rightly claimed a very definite place in urology, it also is sufficiently unsurgical in principle that I have never felt I should attempt complete transurethral removal of large adenomas. It has been my habit to remove all of the obstructing intravesical and intraurethral adenomatous tissue. Since 1930 only six men have presented themselves at later dates on my service at Seymour Hospital complaining of obstructive symptoms and requiring a second operation. Seymour Hospital is a part of Eloise — the County Alms House, with a total population of 10,000, and most of our patients are therefore on the grounds, have access to the clinic and if all is not well they don't miss the opportunity to let us know about it.

Dr. Emmett states that during 1937, 782 patients were resected. I would like to ask him, how many patients there were from whom 10 Gms., 20 Gms., and 30 Gms. of tissue were removed?

And what was the average age of each of these groups. May I also ask what percentage of patients were operated on who did not have residual urine? I am thinking of the patient in the late forties or early fifties who presents himself complaining of a morning backache, perineal discomfort, and indefinite urinary complaints, who on rectal examination is found to have a large, moderately tender prostate, adherent, and usually indurated. The fluid smear demonstrates pus in varying amounts, but no residual urine is found in the bladder. I prefer to treat this patient with heat, massage at regular intervals, dilatation, and deep instillations of mild silver solutions, rather than suggest prophylactic resection or prostatectomy.

EXPERIENCES WITH PROSTATIC RESECTION *

I. R. SISK, M.D.

MADISON, WISCONSIN

Before the advent of prostatic resection, suprapubic prostatectomy was the procedure of choice at the Wisconsin General Hospital. The two-stage and the one-stage operations were performed in about the proportion of two to one. In addition, a few "punch" operations were done for small median lobe obstructions. In 1933, resection of the prostate was begun and this procedure soon became the operation of choice. For the past several years it has been used almost to the exclusion of suprapubic prostatectomy in the treatment of benign hypertrophy of the gland. The few exceptions made are for teaching purposes and not because we believe the suprapubic operation preferable. And, since the layman has become acquainted with the possibilities of prostatic resection, we are finding it increasingly difficult to persuade an occasional patient to submit to the open operation.

We recognize two functions: first, the care of the patient; and second, the teaching of the undergraduate and graduate student. In our department of urology are three residents who serve for a period of three years each, and the training of these men for the practice of genito-urinary surgery affects to some degree the morbidity and mortality of prostatic resection. Teaching prostatic resection to others is a difficult task, for after a period of observation and instruction the student must be permitted to proceed with the job alone and the fate of the patient is in his hands. This is not true of open operations where more direct supervision is constantly possible; yet, we permit each resident to do about fifty resections.

What is the fate of the patient with benign hypertrophy of the prostate at the Wisconsin General Hospital now, and how does it compare with the

* Read at the Seventeenth Annual Session of the American Congress of Physical Therapy, Chicago, September 13, 1938.

pre-resection era? In an attempt to answer this question we have reviewed the records of 100 consecutive admissions of patients to the charity service with benign hypertrophy of the prostate when the suprapubic operation was the procedure of choice, and have compared them with 100 admissions since resection was adopted. These series are regarded as fairly representative of the entire number of patients treated, as the records were simply taken from the cross index files of the hospital and included all patients in a given time with a diagnosis of benign hypertrophy of the prostate. However, the mortality for prostatectomy for this series is slightly higher than the average. Previous review of all prostatectomies in the hospital from its opening to the resection period showed exactly 6 per cent mortality. Also, the death rate for resection in this series was a little higher than it is at the present time.

In the first series it is necessary to exclude from consideration 14 patients for the following reasons: In six operation was not advised either because the disease was not far advanced, or because there were other serious pathologic processes. The following data will, I believe, justify the omission of these:

1. Patient, aged 72, with three ounces residual urine. Blood pressure was 206/95. There was advanced myocarditis with dyspnea.
2. Patient, aged 64, with a small median lobe hypertrophy with little residual urine. Patient also had diabetes and pyelonephritis.
3. Patient, aged 72, with only one-half ounce residual urine.
4. Patient, aged 52, with a small median lobe hypertrophy.
5. Patient, aged 62, residual urine was not recorded but only a small median lobe hypertrophy was present. Blood pressure was 210/130.
6. Patient, aged 67, whose symptoms from the prostate were not marked.

In five patients prostatectomy was advised but was refused. One patient died shortly after admission of a ruptured heart. One patient developed diphtheria while in the hospital and after recovery was sent home temporarily, but failed to return, and one patient elected to transfer to another hospital to the care of another physician.

Of the remaining 86 patients, 72 had one or two-stage prostatectomies, and of these six died (7.9%). Five patients had "punch" operations with no deaths.

In seven instances preliminary suprapubic cystostomy only was performed. Three of these died, and the remaining four were sent home because they never improved sufficiently to permit prostatectomy. Two patients were sent home and directed to resort to intermittent catheterization. One of these was a man of 86 who had a non-protein nitrogen of 73, and no phthalein excretion, and the other was aged 75, with good kidney function but an extremely severe myocarditis.

Summary of 100 Consecutive Admissions Prior to Resection Operation

In this series of 100 individuals we exclude 14 from this review for the reasons stated above. Two patients were sent home for intermittent catheterization.

Seventy-two patients had one or two stage prostatectomies, and of these six died (7.9 per cent). Five had "punch" operations, and seven suprapubic cystostomy only. Three of these died and four were sent home with the tube in the bladder.

A review of the second 100 consecutive admissions reveals that 8 patients were sent home without operation for the following reasons:

1. Man, aged 72, had 300 cc. residual urine, but was disoriented and most uncooperative. Commitment to an insane asylum was advised.

2. Man, aged 77, with 250 cc. residual urine was highly disoriented and uncooperative and the family insisted on taking him home.

3. Man, aged 69, with only 30 to 50 cc. residual urine had advanced heart disease. Operation was contraindicated because of his poor general condition.

4. Man, aged 80, with a long history of heart disease and low cardiac reserve.

5. Man, aged 74, with advanced arteriosclerosis and only 30 to 40 cc. residual urine.

6. Man, aged 78, with cardiac decompensation which did not respond to treatment.

7. Man, aged 66, with 400 cc. residual urine, coronary occlusion, arteriosclerosis and myocardial degeneration. After management by an indwelling catheter for two weeks there was only 100 cc. of residual urine, but the patient was sent home without operation because of his poor heart condition.

8. Man, aged 69. This patient had only 60 cc. residual urine, and his symptoms were not severe enough to warrant operation.

The following eight patients died in the hospital without operation having been performed from causes ascribable to grave general diseases unrelated to their prostatic condition.

Of the remaining 84 patients, 80 had resection and four prostatectomy. Four (5 per cent) of the 80 who had resection died. The causes of death ranged from cardiac decompensation to an operative accident.

Prostatectomy was performed on four patients. In one the open operation was necessary because of ankylosis of the hips. In the others, two suprapubic and one perineal prostatectomy were carried out for teaching purposes. One of these died, but his death was not caused by the operation but to intestinal obstruction from carcinoma of the large bowel.

Summary of Second 100 Admissions During Resection Era

Of the 100 individuals admitted during the era of resection 8 were sent home for reasons above; eight patients died before operation was performed; eighty patients had resection. Of these four (5 per cent) died. Four had prostatectomy. One patient died of carcinoma of the large bowel while still in the hospital.

A comparison of the total time spent in the hospital by the patients in these two series is extremely interesting. In both groups it is much longer than is reported from services of private patients for three reasons. (1) On teaching services procedures of examination are relatively slow. (2) A large percentage of the patients enter the hospital in extremely poor condition, hence require longer preoperative and postoperative treatment. (3) The home environment is frequently such that it is necessary to keep the patients in the hospital until they are able to take care of themselves. The average total hospital days for this series of prostatectomies (excluding those who died) is very long — 79 days. The average total for the eighty patients in the series who had resection (excluding those who died) is 20½ days.

Two subjects relating to resections have recently received a great deal of attention. The first of these is the question of complications. When I presented a paper before this Congress on the subject of prostatic resection three years ago, the complications receiving the most attention were persistent cloudy urine due to infection, slough and hemorrhage. I stated in that paper that the infection, slough and cloudy urine would be no more troublesome following prostatic resection than prostatectomy if sufficient

tissue is removed to permit complete emptying of the bladder. Further experience has convinced us of the truth of this statement, and we must not accept as a satisfactory resection one which simply reduces the residual urine and does not eliminate it.

The question of hemorrhage has been solved by improvement in equipment and technic. Today the complications causing us the most concern in the early postoperative days are those of the heart, and these will probably continue to give us trouble, for if we operated only upon those whose heart permitted a reasonably good rating, we would eliminate a very large number of patients.

The most annoying late complication today, in our experience, is stricture of the anterior urethra. This, of course, is due to too great dilation of the anterior urethra, and can be prevented. We are operating through an external urethrotomy incision in some cases in which the anterior urethra is small, and I believe the number in which the procedure is used should be greatly expanded.

The second problem concerns recurrence or the duration of the relief from prostatic resection. I mention this subject because I hear resection loudly condemned on account of recurrences of growth of tissue or recurrence of symptoms. I can not make any definite statement regarding the percentage of recurrences and in my opinion very few urologists are in a position to discuss the subject intelligently, because until recently very few were removing sufficient tissue to expect permanent results. Return of symptoms frequently is not due to recurrence, but to inadequate removal of tissue in the first place. In a resection which is properly done as much, or nearly as much, tissue is removed as by enucleation. And when this is done it is logical to assume that the recurrences will be about the same in number or slightly higher than those from prostatectomy.

Summary

Resection is a practical procedure adapted to all patients with benign hypertrophy of the prostate who can be placed in the proper position for the operation and on whom the instruments can be passed. If properly done — that is, if adequate tissue is removed — the results are as satisfactory as those from prostatectomy, and recurrences are no more or only slightly more frequent.

The outstanding advantages which this procedure possesses over prostatectomy are:

1. The mortality rate is somewhat lower than for prostatectomy. For individuals whose general physical condition is reasonably good the mortality from resection is very low, almost negligible.
2. The period of hospitalization is much shorter for resection than for prostatectomy. This is of great economic significance.
3. Patients do not fear resection to the extent they do open operation.

STATUS OF TRANSURETHRAL RESECTION *

HARRY C. ROLNICK, M.D.

CHICAGO

Personal experience and training are to a large degree responsible for the type of operation that is favored by the urologist in the treatment of prostatic obstruction. For this reason any discussion of transurethral resection must be considered from a personal as well as an objective point of view. So far as the diverse methods are concerned, statistical data show very little difference in the mortality rate among well trained and experienced urologists who command a large clinical material and who limit themselves to one of the operations, by the suprapubic, perineal or transurethral route.

Perineal prostatectomy has been the routine procedure preferred by a large number of experienced urologists. Within the past few years it has shown some increase in popularity. With few exceptions the urologists who had been performing perineal prostatectomy routinely, previous to the advent of transurethral resection, still favor the perineal approach. Two-stage suprapubic prostatectomy, which was the choice of most urologists before transurethral resection became popular, is still a satisfactory and safe procedure and is being successfully carried out at the present time by a large number of surgeons.

There are a number of operators commanding large clinical material who have adopted and are successfully carrying out routine transurethral resection in all cases of bladder neck obstruction, and with a very low mortality. Their experience now covers many thousands of cases. This operation is not only maintaining its popularity but is employed more frequently by many men.

An attempt will be made to evaluate the various procedures with particular reference to the transurethral method. Most urologists have now had considerable experience with this procedure. Many of the technical difficulties have been overcome and most of the dangers eliminated. The hemostatic bags of Foley and Alcock aid in controlling hemorrhage in most cases. The older urologists, when classic prostatectomy was new, soon learned that partial prostatectomy was not successful, and that obstruction and infection often persisted unless complete enucleation was carried out. All of us learned after a brief period that mere resection of small bits of tissue in prostatic hypertrophy for the establishment of a groove or channel was not satisfactory in most cases. In the presence of median bars and minor degrees of prostatic hypertrophy only a relatively small amount of tissue need be removed, but in large prostates it is necessary to remove a considerable amount of tissue. No matter what the approach is, prostatectomy is necessary for the relief of an obstructing prostate. Of the three operations, transurethral prostatectomy is technically the most difficult, and requires the greatest experience.

The work of Flocks on the arterial blood supply of the hypertrophied prostate is informative and explains the frequent occurrence of persistent infection and slough in incomplete transurethral resection. The internal urethral group of arteries penetrates in the midline at the prostatovesical junction and is the main blood supply to the hypertrophied portion of the prostate. When resection is performed a median cut obliterates these vessels

* Read at the Seventeenth Annual Session of the American Congress of Physical Therapy, Chicago, September 13, 1938.

and deprives the lateral lobes of their circulation. If the lateral lobes are not removed, continued infection and some slough are likely to take place.

Suprapubic and perineal prostatectomy are not ideal procedures because the functional end results are unsatisfactory in a small percentage of cases. Transurethral prostatectomy has considerably more morbidity, and the end results are more undesirable than with the suprapubic or perineal methods, except in the hands of urologists of unquestioned skill.

Although resection of small amounts of tissue is a relatively simple procedure, removal of large prostates transurethrally is time consuming and difficult, and carries with it greater technical dangers than the perineal or suprapubic operation. Some urologists who have persisted in this endeavor over a period of years have finally mastered the technic of transurethral prostatectomy, irrespective of the size of the prostate.

Advantages of Resection

There are two types of instruments now in use for transurethral resection. The "cold punch" of Thompson's is an improvement of the Young "punch", and is employed routinely at the Mayo Clinic. I have had no experience with this instrument. The Stern-McCarthy electro-resectoscope is the instrument used by most urologists. The cold punch does not require preliminary catheter drainage, and with it very little coagulation is carried out. As a result, infection is well controlled. With the resectoscope, when the residual urine is 3 ounces or less, preliminary catheter drainage is obviated. Coagulation should be restricted owing to slough and infection. Most important is the prevention of infection by meticulous asepsis and postoperative care.

The advantages of resection in suitable cases cannot be over-emphasized. Hospitalization is markedly reduced, and the procedure usually is less formidable than the open operation. It is essential to remove an adequate amount of tissue, and if necessary the operation can be repeated after a short interval. None except an ultraconservative would wish to return to the period before resection became popular. The transurethral procedure has greatly enriched our means of removing bladder neck obstruction and has brought relief to many patients in whom an open operation was not advisable. Wherever in my opinion it is feasible, I perform transurethral resection. As already stated, it is technically possible to remove all forms of prostatic obstruction transurethrally. The question, therefore, arises whether transurethral resection is always to be carried out routinely, or whether any of the other established operations should still be employed under certain conditions. When the transurethral procedure was first introduced, I spent considerable time in perfecting my technic in both resection and perineal prostatectomy. I have always felt that the urologist should be able to do any of the operations well. Furthermore, there is nothing as instructive toward a thorough understanding of this subject as to carry out all the established operative methods. I have performed to date about 250 to 300 perineal prostatectomies, and approximately 650 transurethral resections, and probably an equal number of two-stage prostatectomies. The following are my personal impressions, which I believe represent the attitude of most urologists.

Comparison of Methods

Perineal prostatectomy is indicated when there is a suspicion of carcinoma as determined by rectal palpation. Although very little can be accomplished when the diagnosis is made by rectal palpation, an occasional early case may be cured. Complete enucleation or radical removal afford the only

chance of cure in carcinoma. Prostatic calculi and an indurated prostate with localized suppurative processes are best removed perineally. In a man with a large abdomen, perineal prostatectomy is best because suprapubic enucleation would be technically too difficult. If the ureteral orifices cannot be visualized by cystoscopy because of intravesical protrusion, suprapubic enucleation is indicated. Sub-trigonal and sub-cervical prostates are also best removed by open operation. If marked bladder infection is present, or the prostate is soft and spongy and bleeds readily, and there is a history of hematuria, two-stage suprapubic prostatectomy is preferable. In my opinion when more than 20 to 25 grams must be removed, enucleation is the best procedure in most cases.

There are a number of indications for a preliminary cystostomy. With good technic and under local infiltration anaesthesia there is a virtually no mortality. When prolonged preliminary drainage is necessary, cystostomy is preferable to urethral catheter drainage. When intolerance to the urethral catheter and high nitrogen retention do not permit catheter drainage, cystostomy is indicated. Some patients who are difficult to manage are better off with a cystostomy. Preliminary cystostomy is definitely indicated for the removal of large stones and large diverticula. Occasionally in acute urinary retention cystostomy is necessary because of inability to pass a catheter. Although preliminary cystostomy has been almost entirely abandoned by the advocates of routine resection, many of the patients, I believe, would be benefited by it. The incidence of postoperative cellulitis would be much less. Cystostomy is the most satisfactory method of controlling infection. It acts as a safety valve. Once cystostomy has been done, any operation is relatively safe, and the picture is entirely changed. I performed 61 resections at the Cook County Hospital last year, with 2 deaths, a mortality of 3.2 per cent; however, 10 of these patients had had a preliminary cystostomy. The safest of all operations on the prostate is cystostomy followed by resection. In addition, once the bladder is opened, early enucleation can be carried out in most cases as a second-stage procedure. In the hands of the experienced urologist the mortality should be virtually nil.

FURTHER STUDIES WITH FANGO THERAPY *

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and

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At the last Congress of Physical Therapy we[1] reported twenty-five unselected cases of chronic arthritis and allied conditions treated by topical applications of fango to the entire exclusion of any indicated casual or symptomatic therapy. All these patients had their disability for a number of years and did not improve from preceding treatments.

All but 5 of the patients (80 per cent) experienced decided improve-

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† Died August 7, 1939.

ment after a course averaging 20 applications. The conclusion was reached that the effects of fango are attributable to the low specificity and low conductivity of heat, facilitating prolonged thermic influence at controllable temperature. The moisture contained in the preparation exerts the effect of a cataplasm, while the plasticity of the material produces an even pressure on the tissues. The heat no doubt has the well known effects on inflammation and exudates.

At this time we report twenty-five additional arthritis patients who apart from the fango applications have received the benefit of drug treatment and the removal of infected foci and other complicating conditions.

Twenty-two patients were diagnosed to have atrophic and three hypertrophic arthritis. Ten were males and fifteen females. Their ages ranged from 19 to 69 years, seventeen (68 per cent) from 40 to 60 years. The average weight prior to treatment was 150 pounds in the atrophic, and 178 pounds in the hypertrophic group. Eleven patients of the atrophic group had lost 10 to 45 pounds since the onset of their disability, an average loss of 20 pounds.

The average durations of the disabilities for both groups according to the histories given by the patients, as shown in table 1, was four years and

TABLE 1. — *Average Duration of Disability Preceding Treatment.*

Group	Number of Patients	Average Duration	
		Years	Months
Atrophic Arthritis	22	3	8
Hypertrophic Arthritis	3	7	4
Total	25	Mean: 4	1

one month. The disability in the hypertrophic group was twice as long as in the atrophic. It is evident that in both types of patients the chronicity was of considerable length of time.

Of the 25 patients 12 stated that their arthritis had an acute and 13 a gradual onset. A history of "rheumatism" in the family was elicited in 7 patients.

Twenty-one patients presented evidence of focal infection, or conditions likely to have a relation to their arthritic state, as shown in table 2. In 8

TABLE 2. — *Focal Infections and Complications.*

Chronic tonsillitis	4
Chronic tonsillitis and constipation	1
Chronic tonsillitis and pyorrhea	1
Chronic tonsillitis, chronic bronchitis and constipation	1
Chronic tonsillitis, chronic bronchitis and menopause	1
Pyorrhea and constipation	1
Prostatitis	2
Prostatitis, chronic rhinitis and mitral regurgitation	1
Chronic rhinitis, chronic bronchitis and constipation	1
Chronic bronchitis and constipation	1
Mitral regurgitation, constipation and epithelioma	1
Myocardial degeneration and constipation	1
Chronic conjunctivitis	1
Acne rosacea and constipation	1
Constipation	3
Total	21

of these patients diagnoses of chronic tonsillitis were made and tonsillectomies were recommended, but owing to their lack of cooperation no operation

was carried out. It is of interest to note that only one of these patients was markedly benefited; while the others were only moderately improved. On 4 patients no foci of infection could be demonstrated. Three of these were markedly benefited by the treatment.

Nine patients were found to be susceptible to head colds. Marked improvement was observed in 7 at termination of the treatment.

Effect on the Blood

In 24 patients the number of erythrocytes and leukocytes, the percentage of hemoglobin and the sedimentation rate (Linzenmeier's method) were investigated prior to institution of fango treatment and at its conclusion. The averages of these findings are shown in table 3. For comparison we

TABLE 3. — *Comparison of the Average Blood Count, Hemoglobin and Sedimentation Rate in the Two Series of Cases.*

	Red Count		White Count		Hemoglobin		Sed. Rate	
	Before	After	B	A	B	A	B	A
Atrophic Arthritis —								
1st series 14	4,370,000	4,300,000	9,270	8,810	78	77	:52	1:20
2nd series 21	4,236,000	4,204,000	8,890	9,360	74	79	1:16	2:06
Hypertrophic Arthritis —								
1st series 4	4,730,000	4,373,000	7,190	6,675	81	81	3:12	3:50
2nd series 3	4,297,000	4,440,000	8,880	8,850	87	83	3:52	3:52

have inserted the averages obtained in blood studies of the first series of cases. The difference between the two series is not striking, except in the slight elevation of hemoglobin and a greater prolongation of the sedimentation rate in the atrophic group of the second series. The average erythrocyte count shows no influence by the administration of iron.

As in the first series, the number of individual applications varied according to response of the patients. In the markedly improved group the average number was 15½, and in the moderately improved group 16⅓ applications, the minimum being 9 and the maximum 32. Since the second series of patients manifested a better response to fango therapy the total number of applications was naturally smaller, being 400 as compared with 532 in the first series. The average length of a single application was 29 minutes; the average temperature of the mud when applied to the body was 49 C. (120.2 F.); at the termination of an application 41½ C. (106.7 F.), an average drop of 7½ C. (13.5 F.).

As was mentioned all foci were treated except chronic tonsillitis. Twenty-two patients were taking iron and ammonium citrate in doses of 2 Gm. three times daily. In addition to this drug three patients were taking acetylsalicylic acid, 0.6 Gm.; three potassium iodide, 0.6 Gm., and one sodium bromide 0.6 Gm. three times daily. Three patients were taking potassium iodide, 0.6 Gm. three times daily without the iron. The weight of one patient was reduced 11 pounds by dietetic management.

Evaluation of Clinical Results

Table 4 shows that all the patients were benefited in variable degrees

TABLE 4. — *Results of Fango Treatment.*

	Number of Patients	Markedly Improved	Moderately Improved	Total Improved
Atrophic Arthritis	22	9	13	22
Hypertrophic Arthritis	3	1	2	3
Total	25	10	15	25

from the combined therapeutic measures of fango, drugs, and the clearing up of infected foci. Of the atrophic group 9 were markedly and 13 moderately improved. Of the hypertrophic group one was markedly and two moderately improved.

The following case histories illustrate the beneficial effects obtained from the combined treatment which we instituted in the twenty-five arthritis patients:

Case 1. — (No. 44271) M.B., aged 69, laborer, was first seen October 19, 1937. His main complaint was painful swelling of the wrists and fingers of five months' duration. His disability began acutely in the fingers of both hands, gradually involving the wrists. Inclement weather aggravated the condition. Six months ago he developed a dry, nonproductive cough which he still had on admission to the clinic. He had been constipated for eight months. His past history revealed frequent attacks of painful swelling of the right knee, which was diagnosed as bursitis. He had a herniotomy in 1934. All his teeth were extracted in 1934. There was no history of rheumatism in his family.

Physical Examination. — The patient was a well nourished male weighing 190 lbs. Pulse, 72; temperature, normal. The nose showed evidence of chronic infectious rhinitis. Wheezing rales were heard in both lungs. Urinalysis, negative. On first examination the red cell count was 4,420,000, white cell count 13,800, hemoglobin 75 per cent; sedimentation rate 55 minutes. Both wrists were swelled and tender; his fingers were fusiform, tender and stiff. Diagnosis: infectious polyarthritis, chronic bronchitis and chronic infectious rhinitis.

The patient was given 26 fango treatments to the hands over a period of 9 weeks. During this time he was taking 2 Gms. of iron and ammonium citrate and 0.6 Gm. of acetylsalicylic acid, both three times daily. At the termination of the treatment his red cell count was 4,390,000, white cell count 7,650, hemoglobin 95 per cent, sedimentation rate 2 hours and 45 minutes. The hemoglobin increased 20 per cent and the sedimentation rate was prolonged one hour and ten minutes. The pain and swelling of the wrists and fingers were markedly improved.

Case 2. — (No. G3004) M.R., aged, a salesman, was first seen October 25, 1937. His main complain was pain and stiffness in the shoulders, arms and legs; painful swelling at right wrists and right forefinger of eight years' duration. His disability had an acute onset, starting in the wrists, progressively involving the fingers, elbows, hips, knees and ankles. The onset of symptoms was preceded by exposure to cold during winter. He had lost 13 pounds in weight. He was susceptible to colds. His past history revealed scarlet fever, diphtheria and whooping cough in childhood. Denied veneral infection. Tonsillectomy had been performed prior to admission to the clinic. Family history disclosed lumbago in his sister.

Physical examination revealed an emaciated male weighing 125 pounds. He had a discharge from the right nostril, tonsils were absent. Two teeth were infected. The descending colon was palpable. Pus was demonstrated in a prostatic smear. The first blood examination showed 4,870,000 red cells, 12,100 white cells, 77 per cent hemoglobin. The sedimentation rate was 45 minutes. His right wrist was swelled and tender, his right forefinger was fusiform and tender. The right knee and ankle were tender. Diagnosis: infectious polyarthritis, prostatitis, chronic rhinitis.

The following treatment was instituted. Two infected teeth were removed, prostatitis was treated, iron and ammonium citrate 2 Gms. and 0.6 Gm. of sodium bromide three times daily were prescribed. Twelve treatments of fango were administered over a period of four weeks to the hands, back, knees and feet. His red count at the termination of the treatment was 5,400,000, the white count 7,400, hemoglobin 95 per cent and the sedimentation rate 6 hours. The patient was entirely relieved of the symptoms. He was discharged from the clinic able to resume his work. It is of interest to note that the red cells were increased by 530,000, the white cells decreased by 4,700, the hemoglobin increased 18 per cent, and the sedimentation rate was prolonged 5 hours and 15 minutes.

Case 3. — (No. 93690) J. C., aged 56, a laborer, was first seen Nov. 8, 1937. His principal complaint was pain and stiffness in the left shoulder and upper dorsal spine of 18 years' duration. His disability was gradual in onset, starting in the hips and progressively involving the knees, ankles, shoulders and spine. Bad weather aggravated the condition. He had never observed any swelling of his joints. The history of functional symptoms was negative except for nocturia, which he had for the past ten years. He had measles in childhood, malaria in 1905, influenza in 1936. His tonsils were removed in 1926 and hemorrhoids in 1936.

Physical examination revealed a fairly well developed man weighing 149 pounds. Pulse, 72; temperature, normal. Two teeth were found infected. The tonsils were completely removed. The prostate was found enlarged and infected. His initial red cell count was 4,300,000, white cell count 6,000, hemoglobin 85 per cent, sedimentation rate 3 hours and 40 minutes. There was tenderness over the upper dorsal vertebrae. The left shoulder joint was tender and its movements painful. Diagnosis: hypertrophic arthritis, prostatitis.

The following treatment was instituted: two teeth were extracted; the prostate was massaged; potassium iodide 0.6 Gm. three times daily was prescribed. Nineteen treatments of fango were administered to the upper spine and shoulders. At the termination of this course the red cell count was 4,550,000, the white cell count 7,250, hemoglobin 78 per cent and sedimentation rate 3 hours and 50 minutes. Marked improvement of symptoms followed.

Case 4. — (No. 99425) N. S., aged 34, housewife, was first seen January 14, 1938. Her main complaint was pain in the elbows, hands and knees of 6 months' duration. The pain started gradually, first in the right hand; a month later it involved the elbows. Inclement weather increased the severity of the symptoms. In her past history measles were elicited in childhood, influenza at ages of 16 and 30. Herniotomy was performed in 1936. There was no rheumatism in the family.

Physical Examination. — The patient was a well developed, obese female, weighing 201 pounds. Pulse, 78; temperature, normal. Tonsils showed evidence of chronic infection. Other organs were negative. Urine negative. The initial red cell count was 4,430,000, white cell count 7,700, hemoglobin 62 per cent, sedimentation rate 2 hours and 5 minutes. The fingers were tender, slightly fusiform and stiff. Diagnosis: atrophic polyarthritis, chronic tonsillitis.

The patient was given 21 fango treatments to her hands over a period of 8 weeks. She was also given iron and ammonium citrate 2 Gms. three times daily. The second red cell count was 4,400,000, white cell count 4,600, hemoglobin 68 per cent, sedimentation rate 3 hours and 30 minutes. The final red cell count was 4,600,000, white cell count 6,000, hemoglobin 70 per cent, sedimentation rate 4 hours and 35 minutes. The hemoglobin increase was 8 per cent. The sedimentation rate was prolonged two hours and 30 minutes. At the termination there was a moderate improvement in the pain, swelling and stiffness of her finger joints.

Discussion

In this second series of patients we tried to approximate the therapeutic management to that used in private practice. Our results were encouraging. While in the first series fango was the sole therapeutic measure, in the second, drugs were used, and foci were treated in addition to pelotherapy. Perhaps for this reason the average number of fango applications was only 16, as compared with 21.3 in the older group.

We were unable to persuade 9 patients to have their tonsils removed. Only two of these were markedly improved. On the other hand, of the four patients in whom foci could not be demonstrated three were markedly benefited. Our experience with therapeutic measures other than those presented in this paper is that arthritis patients respond better in the absence of focal infection. Table 5 shows a comparison of the results obtained in the two series of patients.

Table 5. — *Comparison of the Results of Fango Treatment in the Two Series.*

Diagnosis	Number of Patients 1st-2nd Series		Markedly Improved 1st-2nd Series		Moderately Improved 1st-2nd Series		Total Improved 1st-2nd Series		Not Benefited 1st-2nd Series	
Atrophic Arthritis	15	22	4	9	7	13	11	22	4	....
Hypertrophic Arthritis	5	3	1	1	4	2	5	3	....	....
Traumatic Arthritis	1	....	....	....	1	....	1	....	....	....
Sciatica	3	....	2	....	1	....	3	....	....	....
Synovitis	1	....	....	....	....	....	....	....	1	....
Total	25	25	7	10	13	15	20	25	5	....
Mean percentage			28	40	52	60			20	

Conclusions

1. Twenty-five unselected cases of arthritis, 22 atrophic and 3 hypertrophic, were treated by a combined method of fango, drugs and elimination of focal infection and other complicating conditions.

2. All the patients were benefited, 10 improved markedly and 15 moderately.

3. The combined method of treatment described proved more effective in relieving the disabilities of arthritis than the use of fango alone as reported in a previous publication.

Reference

1. Vrtiak, Emil; Benson, Simon; Kobak, Disraeli, and Carlson, Anton, J.: Fango Treatment of Arthritis, Arch. Phys. Therap. 9:325 (May) 1938.

Discussion

Dr. Walter Solomon (Cleveland): Heat in rheumatic disorders has undoubtedly been the oldest and most valuable and reliable form of therapy. Its effectiveness is based on sound physical and physiologic principles. Fango therapy according to various authors not only possesses heat per se, but in addition has certain properties which enhance its merits. The statement has been made that fango contains certain chemical and radio-active substances which render it superior to other agents. Analyses have been made which have shown its precise chemical composition. The questions therefore arise, since it contains these unusual substances, how are they absorbed through the skin? And if they are absorbed, in what quantities? Have determinations been made to show an increase in organic or inorganic substances locally or systemically? No doubt this is difficult to determine but should be done either by animal experimentation or with patients. The references in English literature merely cite its clinical use without giving any detailed scientific work. There are many references to foreign publications which I did not have the time to read. Perhaps these contain this information and thus elaborate on this point, which would help to remove this form of therapy from empiricism.

Then another question arises. Is the fango mud superior to the mud from other other sources, and if so, what is the physical or chemical factor responsible for this advantage? The answer to this question would be a great aid in the treatment of these various rheumatic diseases.

Now that at least a year has elapsed since the authors' first report, it would be exceedingly interesting to know the present condition of the first group of twenty-five patients. It is an established fact that an arthritic patient, particularly of the chronic atrophic type, experiences remissions and exacerbations. With no other therapy except fango, have the 80 per cent who were either markedly or moderately improved remained benefited? If the majority of these patients have not suffered a relapse, one can deduce that fango alone has been the beneficial agent. If on the other hand many of the patients, again particularly of the chronic atrophic type, have found it necessary to resort to additional or other measures, one should be hesitant in granting too much value to fango alone.

Thus if fango does not possess chemical or radio-active properties which render it superior to other agents, one has at his disposal other substances which possess similar physical properties. As an example I would cite paraffin which is used extensively in Cleveland. The temperature in a paraffin bath is usually 125 to 130 degrees. Here too, the specific heat is high and its conductivity is low. It has the additional advantages of lower cost, greatere ease of application and may be readily used in the home.

It is an undisputed fact that fango and other forms of pelotherapy have proved very beneficial as therapeutic agents. It is from a critical viewpoint that one seeks careful laboratory and scientific investigations to substantiate its various claims.

Dr. Disraeli Kobak (closing): The meager and somewhat sophomoric discussions of a form of therapy that has as its background the dignity and classicism of antiquity makes one suspect that most of us are so completely immersed in the more recent innovations as to have little interest in critically evaluating a procedure even though it has been employed with benefit throughout the ages. It is reasonable to assume that if pelotherapy is inferior to the multiplicity of methods in vogue, it would by now be definitely interred among the numerous fallacies of medical history. The fact that there is a distinct revival of interest throughout the world is an indication that it merits our study in order to determine its place as a useful adjuvant to the therapy of rheumatic disease. It was for this reason as well as the knowledge that America is extraordinarily rich in resources for obtaining and elaborating the humidified and saprophytic vegetation, peat and special muds, that we began to study the therapeutic effect of the Italian volcanic product (Fango) on a controlled group of chronic arthritics. This was undertaken to determine its exclusive action as well as

that in combination with established methods. It is confessed that early we were puzzled at the favorable results and have since redoubled our efforts against errors and misinterpretations. The two reports with their statistical evidence speak for themselves, and should be of clinical interest to our scientifically conducted spas, sanatoriums and urban communities.

I am sure I voice my associate's disappointment in Dr. Solomon's remarks. Recognized as a critical and progressive student of physical medicine, one was justified in expecting that he would clarify the discussion with certain cogent opinions that would either add to the data already presented or clearly point out their fallacies. It will be distinctly recalled that we questioned any effect related to presence of radio-activity in fango and that we insisted that the action must be attributed to its cataplasmic properties. Apparently the position taken by us which was based on an analysis of the fango powder, has escaped Dr. Solomon, and his reference to the presence of a radioactive substance and its problematic absorption is a matter of faulty information beyond the pale of our report.

It should also be pointed out that Dr. Solomon's interpretation of heat as the basis of action in connection with fango therapy is at best a concept built on an untenable syllogism, because it could easily be shown that the heat of dry and of moist fango has not one and the same effect. Surely no one would concede today that the penetrative and clinical action of dry heat and moist heat, or of infra-red and short wave diathermy have one and the same internal action. On this very point we refer him to a paper published in 1936 by Gesenius in the Deutsche Medizinische Wochenschrift (**62**:1533, Sept. 18) which concisely points out the surprising difference in deep hyperemia produced by dry and moist heat and by high frequency current. Gesenius' studies again emphasize the fact that the transmission and transport of heat through living material is not a matter of turning on a switch but requires specialized orientation in the biophysics of heat. By his confession ("There are many references to foreign publications which I did not have time or the inclination to read.") Dr. Solomon has missed an opportunity to orient himself on the problem under discussion. It would further have made him realize that not only such ancients as Pliny and Galen had already advocated moor baths and mud therapy but modern authorities as Lampert, Boehm and Benade have recently pointed out in their separate books the clinical and scientific basis of pelotherapy. On this subject there is a dearth of information but apparently a paucity of readers. We concede that Dr. Solomon has pointed out one modern innovation as a challenge to fangotherapy; namely, the use of the paraffin bath with its mechanical and economic advantages. Unfortunately he fails to mention upon what scientific basis and comparative studies he arrived at his impressions, to assert that paraffin baths are equal or clinically superior to fangotherapy. In science, facts supersede theories.

Clinical Application of the Paraffin Bath — Zeiter

(*Continued from page 472*)

from burns is insured by an adequate dissipation of heat in all possible directions by the blood stream in the treated parts. When submitted to heat tissues which do not readily congest actively are very susceptible to burns even at temperatures under 130 F. Safety demands that the transmission of heat or near the danger point be made gradually to give time for the circulation to be speeded up before the tissues are heated to the maximum therapeutic point. Friction, massage and exercise, in addition to the procedures enumerated above, are available for this purpose.

The experiments of Dr. Zeiter confirm the principles involved. While paraffin has its specific advantages, all other agents susceptible to practical, convenient and less expensive application can be used effectively and safely if proper precautions are observed.

The most versatile substitute for the paraffin bath which has proved remarkably effective in all conditions, including arthritis, is the "heating compress." This has been advocated from antiquity. It is applicable to all parts of the body. It is referred to as "Neptune's Girdle" or *Umschlag*, when applied to the trunk or abdomen.

The heating compress and the paraffin bath have very similar therapeutic effects although they operate through distinctly different physiologic mechanisms. The first acts through heat of endogenous origin induced reflexly by thermic and circulatory reactions to an application of cold. Incidentally this reaction is usually insured by a short preliminary application of heat.

The paraffin bath acts through the "direct, primary, specific or action" effects of heat of exogenous origin.

THE SCIATIC SYNDROME AND ITS MANAGEMENT *

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Sciatica is a loose term that has been employed for many years to signify any pain in the distribution of the sciatic nerve. All too frequently no attempt is made to arrive at a definite diagnosis, but the label of sciatica is placed upon it simply because the pain is in the back of the leg. It would be far better to treat the pain simply as a symptom until a definite specific cause could be found. Careful search will probably reveal some pathologic process in every case.

Pain in the sciatic region is quite a common complaint in cases referred to the physical therapy department, and intelligent treatment can be carried out only when we have an accurate diagnosis to guide us. The majority of cases respond quite rapidly to appropriate treatment, but much time can be lost with unfavorable results if we employ physical therapy under conditions amenable only to radical surgery.

Sciatic neuritis has some very definite signs and symptoms, which promptly tell us whether we have a definite lesion or the pain is a referred one due to some other cause.

Routine examination should be carried out in every case. A carefully taken history will show that the disease occurs in adults; is usually slow in onset; beginning with pain in the buttock or lower part of the back or thigh. After some time it radiates down the back of the leg to the foot or heel; pain is usually constant, and may be described as dull, sharp, shooting, or boring in character. It is aggravated by motion or sudden movement, as coughing or sneezing. Occasionally the pain may be paroxysmal. It is usually unilateral, and the leg is generally flexed to relieve the spasm. Favoring the side sometimes results in scoliosis in long lasting cases.

The action of the patient is sometimes characteristic. Rising is generally effected by supporting himself on the normal side, placing the hand on the back, bending the affected leg, and balancing on the other one. This is quite characteristic of the disease, and is known as Minor's sign. On bending to pick up an object, the leg on the affected side is promptly flexed to avoid stretching the nerve. This is known as Neri's sign.

Laseque's sign consists of flexing the thigh on the hips and extending the leg at the knee. In sciatic neuritis pain is produced. Care must be taken with this procedure, as some individuals have relaxed hamstrings, and the nerve is not stretched. On the other hand, many have taut hamstrings, and pain may be elicited when there is no neuritis. If in addition the foot is dorso-flexed, the sign is diagnostically more positive.

A search should be made for tender Valleix points, which are found as follows: At the posterior superior spine off the ilium, over the sciatic foramen, midway between the tuberosity of the ischium and the greater trochantes, at the neck of the fibula and below the external malleolus. The knee jerk is usually normal, as the sciatic nerve does not supply the extensors of the leg, but the ankle jerk is diminished or lost. Rarely is there

* Read at the Seventeenth Annual Session of the American Congress of Physical Therapy, Chicago, September 12, 1938.

muscle wasting, paralysis, or change in electrical reactions, except in very long lasting cases, when it is due to disuse.

As sacro-iliac arthritis is frequently confused with sciatica, Patrick's sign should be tried. The knee is flexed and the heel placed on the opposite knee. The flexed knee is then pressed down, when it causes pain in sacro-iliac and hip disease. Jarring of the hip will cause pain in hip disease, and such referred pain in the leg will clear up after treatment through the hip. If the pain is bilateral, we must look for a constitutional cause, and diabetes or syphilis, especially tabes, is the most likely cause. Spinal cord tumors and diseases of the spine, such as tuberculosis or malignancy, may cause bilateral pain. Pelvic disease and tumor in the pelvis may cause pain in the sciatic distribution. Pelvic examination should always be made. Pain in the sciatic distribution may be caused by an infinite number of conditions, and recently attention has been called to rupture of the intervertebral disk, with pressure on the spinal cord, producing pain in the sciatic region.

Since attention has been called to this lesion it has been found in quite a few cases. The patient usually gives a history of lifting and feeling something suddenly give way in the back. There is immediate pain which may be unilateral or bilateral. The pain is in the distribution of the sciatic nerve, depending upon the section of the cord involved, and numbness and tingling are present. Frequently there is tenderness over the spinous process. Muscle weakness and sphincter loss may occur, with loss of the ankle jerk. In doubtful cases the lesion may be demonstrated by x-rays, after injection of iodized oil into the spinal canal. This condition is relieved only by surgical removal of the protruding disk.

Saskin has called attention to narrowing of the intravertebral disk as a cause of sciatic pain. The diagnosis can only be confirmed by x-ray of the spine taken in the lateral and oblique directions.

Radiography is a very valuable diagnostic measure, but certainly every patient suffering with sciatic pain does not need an x-ray. From our experience the average case of uncomplicated sciatica will respond in about twelve treatments. Three of our acute cases had positive x-ray findings, but they were conditions, such as osteo-arthritis of the sacro-iliac and sacralization of transverse process of the fifth lumbar vertebra. These conditions probably existed long before the sciatica, and did not interfere with the cure of sciatica in the usual number of treatments.

Unless there is some definite indication, we prefer to place the patient under our routine treatment, and if we do not get a response in the average number of treatments, we then have an x-ray examination. This is not always of great help, because frequently in patients past middle age, we find evidence of osteo-arthritis of the spine. Roentgentologists commonly see such patients who have never complained of pain. A similar condition may be seen around the sacro-iliac joint without great significance. In our chronic cases, fourteen had positive findings. However, when the other symptoms suggest some definite pathologic process, such as a ruptured disk, cord tumor, disease of the vertebrae, or sacro-iliac disease, the x-ray is invaluable in confirming the diagnosis, and is employed immediately in our routine examinations.

Focal infection indirectly plays a part in some cases of sciatica, but it is often difficult to prove. In our series of cases we had one with an abscessed tooth, which cleared up promptly after its removal. Other patients showed sources of infection as follows:

TABLE 1. — *Infections Complicating Sciatic Syndome.*

	No. of Cases	No. of Treatments	Results
A. Endocervicitis	2	26	Excellent
		21	Excellent
B. Infected teeth	2	25	Much improved
		20	Excellent
C. Infected prostate	3	8	No improvement
		12	Much improved
		1	No improvement
D. Infected tonsils	4	6	Slight improvement
		8	Improved
		8	Improved
		21	Excellent
E. Infected crypts of Morgagni	1	38	Excellent

The above patients were treated for their focal infection, but irrespective of the foci and of their outcome, the number of treatments and corresponding results were analogous to those without focal infection.

During the past year there were sixty patients referred to the physical therapy department of the Jefferson Hospital suffering with pain in the distribution of the sciatic nerve.

The youngest patient was 21 and the oldest 70. However, most of the cases occurred during middle life. There was very little difference between the number of males and females, 33 and 27, respectively, showing that sex plays no particular role. There was also no striking significance in the distribution by age groups as shown in table 2.

TABLE 2. — *Distribution of Patients According to Age Groups.*

Years	Patients
21 to 30	12
31 to 40	16
41 to 50	14
51 to 60	12
61 to 70	6
	60

Out of 69 patients, only thirteen were acute, that is they had the condition less than one month, while forty-seven gave a history of from one to many months. It is quite apparent from this that these patients were sent to the physical therapy department only as a last resort, and after many other forms of treatment had been tried. It serves to illustrate that the advantages of physical therapy are not sufficiently well recognized to have these cases referred before they become chronic.

The distribution of the pain was interesting, as twenty-eight were on the left, and only fourteen on the right side, as shown in table 3.

TABLE 3. — *Grouping of Pain.*

Distribution	No. of Pts.
Right	14
Left	28
Bilateral	6
Referred pain	9
Undetermined	3
	60

In this series there were six cases of referred sciatica that is, sciatica neuritis was not present, but the patients complained of pain in the distri-

bution of the sciatic nerve. All these cases improved under proper treatment except two of endocrine origin and one of purpura haemorrhagica. The correct diagnosis in these cases enabled us to secure results without wasting time by treating them as sciatic neuritis.

There were six cases of bilateral sciatica, two of which had diabetes, one a cord tumor, while in three the pathologic process was not diagnosed.

Here again a knowledge of the underlying cause enables us to afford more intelligent treatment. Some of these cases are not suitable for physical therapy, which therefore would be futile. The patients treated in the physical therapy department are mostly referred ones, and unfortunately many are sent with incomplete examinations. In order to render useful service it is often necessary to re-examine individuals coming in for treatment. Accordingly, we frequently call upon consultant services for aid. This is particularly true if the patient does not appear to respond to routine physical measures.

There are instances when a gynecologic examination is of great value, since pelvic tumors, inflammatory diseases, and the like, frequently produce sciatic pain by pressure. Again, a genito-urinary consultation should not be overlooked in infection in the prostate. There is also the possibility of carcinoma of the prostate producing distinct sciatic pain. It has happened more than once that patients have been treated for sciatic pain caused by carcinoma of the prostate.

Patients with local infection in tonsils and sinuses are referred by us to the appropriate service. It stands to reason if any infection is present, every effort should be for its eradication. This has proved of distinct value in hastening recovery.

A similar procedure is followed in bilateral sciatica, with or without diabetes and syphilis. Likewise, the presence of a cord tumor must frequently call for neurosurgical confirmation and management.

Treatment

The treatment of sciatica in this paper will be confined entirely to the measures employed in the physical therapy department. It is employed only in those cases in which the diagnosis of sciatic neuritis is quite clear, or in which the pain is referred to the sciatic distribution from some condition amenable to physical therapy.

The diagnosis is the most important factor. Cases such as rupture of an intervertebral disk, which obviously is a surgical condition, and various orthopedic affections, such as sacralization of the fifth lumbar vertebra, are referred to the proper department for treatment.

The principal physical therapy measure that is of use in the treatment of sciatica, is heat in some form. Infra-red rays are frequently used, not only for their sedative effect, but because they prepare the tissues for treatment by other measures. Infra-red heat is not penetrating, but in many instances produces distinct alleviation of pain. It is a measure that can always be used even in the most acute stage, before any other treatment can be attempted.

Of the more penetrating types of heat we still feel very favorably disposed toward long wave diathermy, which we have used for many years. Thus, whenever it is necessary to produce heat along the entire distribution of the nerve, more effective heat can be produced by long wave diathermy. We place one electrode under the sacro-iliac joint, and a cuff electrode around the ankle. The current is applied at comfortable tolerance, from one-half to one hour. In this period there is a marked increase in circulation. Heat is well distributed throughout the entire limb.

The various forms of short wave diathermy may also be employed in some instances. It is probably not as easy to confine the energy of short wave to the tissue, and certainly a considerable amount of it is lost in the air. Our technic in using pads is to place one under the sacro-iliac region, and a cuff around the ankle. This probably produces a better condenser effect than any other method of applying short wave diathermy. It has been our experience, however, that the patients do not respond as quickly to this type of treatment as they do to long wave diathermy.

An improvement on this type of treatment lies in the use of the coil. Here we are using an induced current, which produces heat by ohmic resistance, and we actually have a current flowing in the tissues. The coil can be employed as a loop running up one side of the leg and down the other. As a rule the coil is not long enough to encircle the entire length of the limb. This type of short wave we believe has an advantage over the pad technic, but we still feel that the results are not as quick as when we use long wave diathermy.

It is a well known fact that heat is definitely sedative, and will relieve pain in the majority of conditions, but we must not forget that it is not a curative procedure. The increase of heat in the part produces an increase in circulation, and it is this increased circulation which is effective in relieving the pathologic process causing pain.

We have used two general classifications for results. First, those in which heat alone was used. We made no attempt to separate the various sources of heat, but infra-red, long wave, and short wave diathermy were all included. The results in the cases in this series (table 4) were as follows:

TABLE 4. — *Effect of Various Types of Thermotherapy.*

Percentage of Cases	Number of Treatments	Results
20	12	Slight improvement
30	10	Improved
40	25	Much improved
10	38 (one case)	Excellent

It can be seen from table 4 that the results improved with the number of treatments taken. Those who did not obtain complete relief were patients who did not continue treatment for a long enough period.

The second group of cases received other measures in addition to heat. One of the most effective of these additional forms of treatment is the rapid sinusoidal current. This is a type of treatment that we have used for many years, and which was brought to the attention of the profession by Dr. Benjamin Ulanski, former assistant in the physical therapy department of Jefferson Hospital.

The rapid sinusoidal current is simply the ordinary 110 volt, 60-cycle, alternating current, or some modification of it, which may improve its quality. The action of the treatment is not definitely known, but we have found that in all types of neuritic pain there is a very marked sedative effect, which at times is produced with only one treatment. We feel that while it may not be curative in itself, it at least relieves the patient of his symptoms, and this allows the physician to carry out his treatment to eradicate any pathologic processes.

The technic of application is rather simple. We use two small moist asbestos electrodes, about one inch in diameter. One electrode is placed over the sciatic notch, and the other at the lowest point of distribution of the pain, which is usually around the ankle. The current is then turned on, and the strength is increased until a tonic spasm of the muscles is produced.

The strength of the current may be increased to as much as the patient can tolerate. The duration of this treatment is one minute. While application of the current is painful, the relief experienced is so marked that there is seldom any objection to further treatments.

The value of the static current in sciatica must not be overlooked. Some of the pioneers in physical therapy felt that the static wave current was the only type of treatment to use in these cases. Unfortunately, static machines are now seldom seen except in some hospitals. There are certain cases in which nothing else acts so well as properly applied static wave current. It has been brought out that this current also serves as a diagnostic agent. In any case of true neuritis, if the current is applied over the site of the lesion it is followed by a persistent ache. The contractions produced by this current have the effect of squeezing out the exudate which may have formed in the nerve sheath, and produces pain by its pressure. The frequency of the interruptions should not be more than fifty per minute, and the length of the spark can be increased according to tolerance.

Static sparks are also used following static wave current, or in some cases where the patient has received only heat. In all cases of neuritis there is always a certain amount of associated muscle spasm. This is an attempt on the part of nature to splint the nerve. After the pathologic process in the nerve has been relieved, this spasm frequently remains, and the use of well placed sparks over the muscles of the thigh and leg will do much to relieve the residual pain and relax the muscular spasm.

The galvanic current is also a valuable aid in the treatment of some of these conditions. There are instances in which the use of the galvanic current alone, passed through the sciatic nerve down to the ankle, will produce a decidedly sedative and beneficial effect. As a rule the positive pole should be used over the sciatic notch, as this is usually the site of the lesion in the nerve.

Recently histamine and mecholyl have been introduced to the profession. We have occasionally employed them in suitable cases, driving the drugs in from the positive pole. We use a weak solution under the positive pole, and include as large an area as possible in the region of the sciatic notch.

The combination of heat, and one of the other physical measures just mentioned, such as static sparks, rapid sinusoidal current, and others, proved of decided advantage over the use of heat alone in our series of cases. It gave quicker relief of pain, and reduced the number of treatments. The average number of treatments with heat alone, as compared to that of the combined method, shows the distinct advantage of employing these additional measures. The average number of treatments with heat alone was twenty-one; whereas, the average number of combined treatments, was fourteen; a saving of time and expense.

In our group there were five cases of bilateral sciatica, and the treatment consisted of appropriate measures directed at the underlying causes, which were diabetes, prostatic infection, and tumor of the spinal cord. This latter case came to operation, because a block in the downward path of lipiodol revealed the presence of a growth.

These patients also received long wave diathermy applied by means of a large plate under the sacro-iliac joint, and a bifurcated cord attached to cuffs around both ankles, the usual time being one hour. In conjunction with this the rapid sinusoidal current was applied in the manner above described. The results were excellent in all cases, except the one which came to operation for the spinal cord tumor. The average number of treatments was

twenty-one. These results could only be obtained when the underlying cause also was properly treated.

We treated nine cases of referred sciatica. These had none of the typical findings of true sciatica, except pain in the sciatic distribution, and a very thorough investigation was made as to the cause of the referred pain. Two cases were due to endocrine dysfunction, and the usual method of treatment with physical therapy was employed with no results. One case of purpura haemorrhagica was treated with no results. The remaining cases were given short wave through the lumbo-sacral region, and responded very well.

Recapitulation of Results

When the entire series as a whole is considered, there were only nine patients of referred pain. The results of the remaining fifty-one with all types of neuritis, responded as follows:—

The average number of treatments was 14.8 per patient. As a result of treatment, 19.6 per cent showed excellent results; 23.9 were much improved; 50.0 were improved, and only 6.5 per cent showed no improvement whatever. The patients not improved either did not have sufficient treatment, or there was some constitutional background which prevented full effect of the treatment.

We feel that this study has served to bring out several interesting points:

1. A careful diagnosis must be made in each case. One cannot depend upon the referred diagnosis, as the case may not have been studied sufficiently. Sciatic neuritis has definite signs and symptoms, which are easily elicited, and readily lead to a correct diagnosis. When we realize the multiplicity of conditions which can be mistaken for sciatic neuritis, the necessity of a correct diagnosis is apparent. It is only in this way that we can secure consistent results by physical therapy, and save ourselves the disappointment of trying to relieve a condition that is not amenable to this form of treatment.
2. If the diagnosis is correct, the use of heat, rapid sinusoidal, galvanic, and static currents, will probably produce results in twelve to fourteen treatments.
3. If the patient does not improve in that period we probably have not made a correct diagnosis, and the case should be studied more detailedly.
4. Pain in the sciatic region can be relieved in the great majority of cases, but those requiring surgical or orthopedic treatment should be discovered early and returned to the proper department.
5. Patients must receive a sufficient number of treatments for effective results.

Medical Arts Building.

EXPERIMENTAL LOWERING OF THE BODY TEMPERATURE OF RABBITS AND ITS POSSIBLE APPLICATION IN MAN *

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As a natural consequence of the use of high fevers for therapeutic purposes the question of the value of lowering temperatures immediately suggests itself. Physicians in earlier times often thought that a fever ought to be kept down but no mention is made of any attempt to suppress the temperature below normal. Subnormal temperatures have however been recorded in the literature, chiefly in individuals exposed to cold while intoxicated. Tigerstedt, quoted by Britton,[1] cites one case with recovery from 24 C. (75.2 F.). Harkins[2] quotes Reincke as having observed hypothermy in three drunken men. One had a rectal temperature of 27 C., 23 hours before death, another 26.4 C. 13 hours before death, and a third 24 C. with recovery. Davison and Selby[3] described a case of angioma of the third ventricle with the body temperature ranging between 90-96.6 F. for three months, the average being about 92.5. Davison and Selby's case showed a very reduced metabolic rate at times as low as —46, a slow pulse and a low blood pressure, but the patient had a pathologic process associated with it. Barcroft of Cambridge subjected himself to cooling his body until he virtually lost consciousness. He believed that the higher centers of the brain were the first to become reduced in function.

From the point of view of applied medicine the question of hypothermy is of some importance. Britton states that the mortality of excessive cold in the United States ranges between 200-400 a year. Study of subnormal temperatures may provide a scientific basis upon which to construct their rational treatment and thus reduce mortality. In addition knowledge may be provided by which artificial hypothermy can be utilized in the treatment of disease, just as its opposite fever therapy is. With these ideas in mind I undertook some preliminary experiments in rabbits in order to ascertain how rapidly the temperature could be lowered, the extent and length of maintenance under certain conditions, and its effects.

Experimental Findings

The experiments were conducted in the following manner. A box was constructed in such a way that it fitted tightly into the opening of an icebox with a uniform temperature of 39 F. On the front of the box there was an opening through which the animal's head could protrude and also through which the animal could be moved in and out by means of a sliding shelf, on which it was resting in the box during the experiment. The temperature of the animal was taken rectally with the thermometer inserted 5 to 10 cms.

A total of 18 experiments was conducted. During the first 12 of these chloral hydrate, urethane or alcohol were used as narcotics. Chloral hydrate proved unsatisfactory after two experiments, the animal not going to sleep and the temperature going down only 4 degrees C. in four hours. In the next 6 experiments urethane was used as a narcotic, 2 grams per kilogram of body weight being given into the stomach. This produced a satisfactory narcosis. In experiment 3 the temperature was lowered 11 degrees in 8

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hours. In experiment 4 the temperature was kept 3 degrees C. below normal for 6 hours. In experiment 5 it was kept 5 degrees C. below normal for 3½ hours. In experiment 6 it was 5 degrees C. below normal for 6 hours. In order to lower the temperature to the desired level it would take anywhere from 4-8 hours and to complete one experiment would require 12 hours. In order to shorten the time the next experiments were performed with the rabbit's fur thoroughly washed with soap and water. With the natural insulation of the rabbit thus removed there was no difficulty in lowering the temperature. In experiment 7 the temperature was lowered 17 C. and kept there for 1 hour. The animal seemed to have no ill effects after the temperature had been restored to normal. In the next experiment the temperature was reduced to 21 C. and was kept under 23 C. (73.4 F.) for 5 hours. The temperature was then restored to normal. For three days this rabbit's temperature would not stay normal, always returning to about 36 C. after the animal had been heated up. Upon death microscopic examination performed by Dr. Max Strumia showed in "the lungs a diffuse severe acute patchy pneumonitis, confluent, extending to practically the whole lung. Some of the bronchioles and alveoli contained greenish material, possibly inspired food. The brain showed anemia, the liver very mild cloudy swelling, spleen—congestion, heart—acute myocardial degeneration, kidneys — congestion, striated muscle — no pathological lesion, ovary — no pathological lesion." As this animal had been given nutrient fluids by a stomach tube there is no doubt in my mind but what we were dealing with an aspiration pneumonia. It is surprising, however, that in spite of the pneumonia there was a tendency for the temperature to stay 5 degrees C. below normal unless artificial heat was supplied.

My impression is that the heat regulating center had been upset by the prolonged and pronounced hpyothermy to which the animal had been subjected. This is exactly the opposite to what happens when the heat regulating mechanism is upset during fever, with the temperature going higher and higher. This experiment also demonstrates the necessity of supplying large amounts of heat to the body in order to restore the temperature to normal when a hypothermic state exists. The animal with a body temperature of 21 C. was left in an environment of 22 C. In two hours the temperature rose only 2 C. and then started to decline again. To restore the temperature to normal the animal was put under a radiant heat cradle with an environmental temperature of 45 C., as was done in all other experiments. In order to rule out urethane as a cause of death, control experiments were performed and it was found that the doses of the drug used actually could cause death. Therefore the drug was discarded and the remaining experiments were carried out with alcohol as a narcotic or without any drugs at all. With the fur washed with soap and water and the extremities bandaged, to prevent motion and heat production, the temperature could be lowered very rapidly. Animals survived a reduction of the temperature from 41 to 16 C. when radiant heat was used to restore it to normal. One animal was kept below 24 C. for 6 hours, but developed frostbites of the ears and the tail.

The general observations made during these experiments show clearly that the body temperature of rabbits can be quickly and safely lowered for a considerable length of time. The lower the body temperature is, the shorter it can be kept lowered. The lower limit, at which death occurs appeared to be 16 C. Frostbites and weakness of the hindlegs occurs with the body temperature below 24 C. and an environmental temperature of 4 C. This seems to be definitely related to the chilling reflex. Shivering does not begin

during the cooling until the temperature has gone down to 37 C. It persists until the temperature has gone down to 25-24 C. and then stops. It reappears again at 24-27 C. when the animal is being heated up, and stops again at about 37 C. Alcohol decreased shivering but did not stop it.

With the decreasing temperature there arises gradual paralysis of the central nervous system. This is manifested first by drowsiness and then by coma, permitting below 22 C. operations without evoking any response in the animal.

The respirations and the pulse go down. At 16 C. the respirations may be only half of the original number and appear to be wholly diaphragmatic, indicating complete paralysis of the accessory muscles. The pulse decreases from 250 to 30 or less. In one rabbit allowed to cool until breathing stopped, which was just below 16 C., the heart was found to beat when the chest was opened. The rate was one beat every 40 seconds and it kept up, slower and slower, for one hour. Microscopic examination of this animal, in which death was due entirely to hypothermy showed "lungs — severe congestion, partial collapse, liver — doubtful congestion, myocardium — no pathological lesions, kidneys — congestion" as reported by Dr. Max Strumia. This is accounted for by the continued beating of the heart.

Blood counts taken on one animal at a temperature of 23 C. showed a reduction of leukocytes from 10,300 to 5,200 with a slight increase in the percentage of polymorphs and a decrease in the percentage of lymphocytes. There was no material change in the erythrocytes or the hemoglobin.

On the basis of these experiments and the work of others[4-5-6] I would venture to predict that hypothermy can be safely induced in human beings. The investigations of Tainter[7] may be cited as pointing to a practical application of a cold environment if not of actual hypothermy. He injected a determined dose of dinitrophenol into pigeons and observed 100 per cent mortality if birds were kept in a room temperature of 24 C. The average maximum fever was 8.4 C. If the birds were instead kept in a cold room with a temperature of 3 C. only 25 per cent died, the average fever being 0.8 C. He concluded that dinitrophenol failed to cause its usual stimulation in rats, guinea pigs, and pigeons kept at atmospheric temperatures of 2 to 6 C. as indicated by oxygen consumption or body temperature changes, and it caused fewer fatalities. He observed that the drug increased oxygen consumption 130 per cent when animals were kept at room temperature and only 13 per cent when kept at 3 to 6 C.

Based upon the physiologic changes produced, hypothermy might be found useful to reduce temporarily high fever, high metabolic rates, rapid heart action or to give the heart a rest. Operations might be performed as there is loss of consciousness at low temperatures.

A sufficiently low temperature for a direct lethal effect upon bacteria can probably not be achieved as most of them survive intense cold. It is possible, however, that the growth and population cycle might be affected, especially in the mesophilic group of organisms, that is those that thrive best between 37 C. and 40 C. In addition a detrimental environment for organisms may be produced by reduction of oxygen and carbon dioxide. This may also have some effect upon young and growing cells, such as are found in cancer. The subject merits investigation in human beings.

Conclusions

1. In an environment of 4 C., hypothermy can be safely and quickly produced in rabbits. A body temperature below 24 C. in this environment will result in frostbites, depending upon the length of exposure. This is probably due to the fact that shivering ceases at about 24 C. The lethal

temperature appears to be about 16 C. To restore the temperature to normal, large amounts of heat have to be supplied.

2. At low temperatures there is paralysis of the central nervous systems, slow pulse, slow respirations and a low basal metabolic rate.

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FEVER THERAPY BY PHYSICAL MEANS *

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The literature is replete with research and clinical reports dealing with various phases of fever therapy. This fact leads one to conclude that there is a growing interest in the subject and that this development has already reached a capacity which justifies a report of its present status. Such a report should not be studded with scientific references nor discussion of literature already published, but should be seasoned with points of practical experience which will be of value to the neophyte, especially one who is starting to foster the project in places remote from the facilities of research and medical teaching centres.

The medical profession at large has very correctly been slow and cautious in accepting high fever of long duration being promiscuously applied to the sick. They have recognized its potential dangers. Fortunately the pioneers of this therapy have assumed an aggressive attitude and succeeded in laying a solid foundation.

It is the intention of this discussion to deal briefly and solely with phases that have proved of clinical value.

Mechanism of Fever Production

The mechanism of fever production is important and cannot be overemphasized. A lengthy physiologic discourse is beyond the present scope but a few clinical data are of value. The human organism is equipped with a mechanism which in a normal state maintains the bodily temperature at a definite level. Heat production and heat dissipation are balanced in this

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set-up. Any apparatus which will either increase heat production or decrease heat loss will naturally increase the systemic temperature. It must be remembered, however, that in the normal state of temperature balance the skin by actual measurement remains at a lower temperature by 1½ to 3 degrees to the internal body temperature. Under this normal mechanism the skin remains cool, free to eliminate and carry on its normal excretory function. Therefore, in the production of artificial fever the choice of apparatus which will produce the desired temperature and still adhere closest to the normal mechanism is essential. Of no less importance is a recollection that the electrolytic concentration of the blood stream and body fluids is about 0.85 per cent, while that of the tissues proper is lower. These two physiologic points are most significant.

When the body is placed within a heating field to produce internal heat or fever, in which the skin must first be superheated, that apparatus has reversed a basic physiologic mechanism. The skin is "baked" and likely to interfere with normal excretory function. Such a phenomenon, in my opinion, exists in many of the appliances used today in fever therapy. I think the principle is wrong.

Likewise, when various currents are used those which exert their maximum heat at an electrolytic concentration below 0.85 per cent will naturally heat the tissues to a greater degree than the blood stream, and vice versa. This point is well illustrated in figure 1.

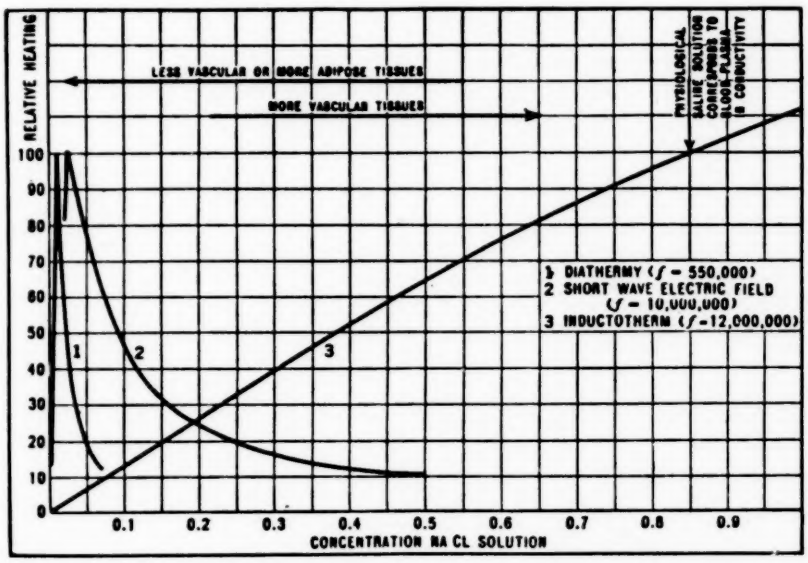

Fig. 1. — Showing the comparative heating effect upon electrolytes in different concentrations by diathermy, radiothermy and electromagnetic induction. Note that maximum heating by induction occurs at 0.85 per cent (physiologic) concentration as compared to 0.1 per cent with the other two. [Merriman, J. R., Holmquest, H. J., Osborne, S. L.: Am. J. Med. Sci. **187**:677 (May) 1934.]

Based upon this reasoning it would appear that electromagnetic induction probably adheres more closely to physiologic principles than most agents in present use. If this be coupled with an air conditioned cabinet which will operate at low temperature (not over 110 F.) and a high humidity (90-95 per cent), heat dissipation will be controlled and a very safe and satisfactory agent used.

Selection and Preparation of Patients

Selection of the patient is a phase of the general management difficult to discuss because it hinges so closely upon individualization. After years of experience we are no longer fearful of many of the conditions which in the early days were considered as contraindications. For example, where once we excluded hypertension, nephritis, cardiac disease and young children, we now obtain some of our best results in precisely these patients. If due diligence is paid to physiologic principles, choice of apparatus, and caution is observed by well trained operators, the contraindications to fever therapy can be markedly reduced.

Proper preparation of the patient constitutes one of the most important measures of the entire management. It should be based entirely upon building up a reserve and a defense against factors of depletion which are encountered during the treatment. When proper attention is paid to this phase, it will result many times in a successful treatment where complete failure would be the outcome if it were ignored.

General metabolism is increased during fever seven per cent or more for every degree of temperature above 99.5 F. Oxidation is carried on at a more rapid rate with all of its associated gaseous and chemical changes. The leukocyte count is increased, the sedimentation rate is changed and a host of other changes take place. Under these conditions one must not allow the reports of a laboratory chemist to be the entire basis of management. Countless analyses of blood sugar have been made during the fever process and none has varied sufficiently from the normal to be of any marked significance. Nevertheless, common reasoning must indicate that when oxidation is increasing in multiples, glucose will be mobilized and burned. Based upon this reasoning it is well to bring the patient to the fever cabinet in the morning with the liver saturated with glycogen, in order to avoid the improper practice of administering nauseating sweet juices after the treatment has been started, and thereby to create a cycle of vomiting which is disastrous. It cannot be over-emphasized that saturation of the liver with concentrated carbohydrates for twenty-four hours preceding treatment is valuable.

No one with experience in fever therapy longer doubts the importance of chloride loss. In the early days many saw convulsions result from this depletion. If the patient starts vomiting, the loss is even greater.

It should again be emphasized that the chloride content of the blood does not constitute the sole measuring stick for what is going on in the tissues and cells. Clinicians have at last awakened to the fact that in diabetes the patient can be starving, and even dying, for want of chlorides and still the blood chloride by chemical analysis may be even higher than normal at that very moment. The same is true during fever.

I question the logic of giving salt solution by mouth during treatment for the protection against chloride depletion. A large majority of perfectly normal individuals will at once become nauseated and vomit when given this horrible concoction. Then why give it to the sick when they are in addition being exposed to the ordeal of high fever?

The problem can be solved with ease by simply saturating the body with salt from six to eight hours prior to treatment. Most men can take, and many even relish large quantities of salt when placed upon a sour fruit such as lemon, lime or grapefruit upon which they can suck. Utilizing this method, it is simple and easy to saturate the tissues with chlorides six to eight hours prior to treatment. Contrary to general opinion, the chlorides are not rapidly eliminated before treatment is started. In order to test this out, we have purposely super-saturated patients eight hours before and have brought them to and through their treatment with some waterlogging still

present from oversaturation. By proper chloride saturation prior to treatment, small non-nauseating amounts can be taken and relished during the fever with safety from tissue depletion.

Water balance is of extreme importance during fever. To the casual observer it would appear that literally gallons are excreted during treatment. On the other hand, by giving too much water patients can become waterlogged under treatment and we have experienced three cases of acute dilatation of the stomach which we feel were definitely attributable to the rapid introduction of water.

We begin saturating our patients with water two to three hours prior to treatment and during the fever administer it slowly, limiting the total intake to below 5,000 cc.

It is reasonable to assume that protein is consumed in a considerable amount during fever. Increased protein intake for twenty-four hours prior to treatment is desirable as well as giving liberal, easily assimilated protein after treatment has been completed.

Opinions seem to differ regarding the value of attention to the gastrointestinal tract prior to treatment. Our experience has proved that vomiting and gaseous distention during treatment are lessened when thorough evacuation has been obtained six to eight hours prior to treatment and when solid food has been withheld at least six hours before fever induction.

Supervision of Patient During Treatment

The management of the patient while under actual treatment is much simplified if proper attention has been paid to pre-fever preparation. It is my emphatic opinion that no technician should be entrusted with the responsibility of managing fever until after he or she has been competently trained. The utmost diligence with respect to frequent observations of pulse, temperature, respiration, prevention of burns and unexpected reaction is so essential that it needs no further discussion. I am astounded that some workers still depend solely upon oral temperature while producing and maintaining fever. It has been proven time and again where oral temperature may lag as much as three degrees Fahrenheit. Fluid, glucose and chloride balance have already been discussed.

Psychiatric management during the fever ordeal is of great importance. These patients at best are very uncomfortable and many of them are sick. They have learned about potential dangers and tragedies, and naturally are apprehensive and often suffer from actual fear. For this reason it is our practice to prescribe sedatives several hours prior to treatment, in order to be in a calm and passive state. We are most rigid in our rules of discipline with regard to noise, conversation and confusion during treatment. Our department is purposely set apart from others in order to insure privacy. We bar all visitors during treatment.

For several years the fever therapist has been called upon to administer arsenicals and various specific drugs at the temperature peak. This procedure seems to be perfectly safe as borne out by experience. However, it is well to be cautious regarding some literature being circulated advocating the safety of giving these drugs at temperature peak when otherwise the patient is hypersensitive to them. It is often true that small doses will be tolerated at this phase when otherwise a reaction will occur. But unless great caution is observed severe reaction can take place also during fever.

More recently there is developing a call for intramuscular administration of sulfanilamide during the rise of temperature. This also has proved uneventful in our experience. There is a virtue to giving it at this time in patients who develop leukopenia following its administration, due to the

fact that the fever will hold up the white cell count.

Various sedatives have been used by different investigators. They are apparently well tolerated, but personally I am as yet far from being satisfied with any we have used.

Intravenous injections of glucose, saline or Ringer's solutions are used by many, but we do not find them necessary except in emergencies.

Danger Signals and Safeguards

Here is where the technician reigns supreme, because he is constantly on duty. Fever therapy should be entrusted only to operators of experience, intelligence and sufficient training to carry out this potentially dangerous procedure. Supervising physicians should, therefore, school their technicians in the recognition and management of danger signals.

Signals of danger may flash from any one of several systems. With threatening respiratory failure the need is for carbon dioxide and oxygen, respiratory stimulants; but no good can be accomplished by digitalis which is often given promiscuously for any and all types of reactions.

If the warning points to cardiac failure then digitalis or other cardiac stimulants are in demand and CO_2 is of no value. Patients may show reactions when they are already over-hydrated with fluids and these cases do not require abundant intravenous solutions but rather need dehydrating measures. Adrenalin, frequently given blindly, is ineffective when the vascular system is depleted of normal fluid content. In these cases intravenous solutions are indicated and of much superior value. Caffeine is too frequently given in all reactions. It is of no value when the respiratory center is already working overtime, but of definite good when stimulation is needed.

All of these vital conditions must be recognized early by the operator who is with the patient continually during treatment. That operator can only become capable through special schooling by the supervising physician. In our institution physicians and technicians jointly go to school each week.

609 Huntington Building.

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(Discussion of this paper to be published in a succeeding issue of the ARCHIVES. — Ed.)

VALUE OF SITZ BATHS IN GENITO-URINARY DISEASES

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STAPLETON, NEW YORK

Hydrotherapy is older than our medical history. The ancients set great store on baths. The "thermae" of the Greeks and Romans remain famous to our day. Smollett[1] in the eighteenth century recommended "The semi-cupium over the pediluvium for disease of the viscera; in colic pains, and spasmodic contraction of the intestinal canals, and in violent constrictions of the tender membranous tubes (such as the ductus cysticus, ureters and urethra) when they are blocked up and irritated by rough angular concretions." Hydro-

therapy has stood the test of time. It is one remedy that medicine of the future will not underestimate.

Rationale of Hydrotherapy

Man is of the homiothermous (constant temperature) group of creatures, who is unable to adapt his body temperatures to their environments, in contra-distinction to the poikilothermous, who change their body temperatures in accordance with their surroundings, such as fishes, reptiles, and amphibia.

Man's temperature is fixed within narrow limits. Small excursions from this fixed range imply an abnormal state of health. In most diseases of an infectious nature the body reacts with fever, a quickened pulse or increased rate of circulation, and a more rapid respiration. By aid of these means the bacterial invasion is resisted through phagocytosis, anti-body formation is generated, and the processes of repair set in order.

The present day conception of fever has changed from the past. It was considered a factor in disease to be combated. Today the thermal death-point of pathologic organisms is sought. The natural reactions by fever are far exceeded by the present day hyperpyrexia methods.

Hyperpyrexia has been found to be of great value in the treatment of venereal diseases. Its use involves expensive equipment, trained personnel, certain risks and limitation of application which are beyond the scope of this discussion. It is to a safe, economic, generally available means of producing many of the beneficient effects of higher local temperatures, that I direct attention — the sitz bath.

When warm moist heat is applied to any portion of the body in health, a dilatation of the cutaneous vessels occurs; a reflex dilatation of the deeper vessels accompanies this reaction; the rate of blood flow through the part is increased and consequently the local biologic processes are enhanced. If local disease is present, the above reactions are favorable in the sense of immediate relief of tension, pain and the increased blood flow to hasten the reparative processes.

The venereal diseases, because of their site, are particularly well adapted to that form of hydrotherapy known as the hip bath. By venereal diseases I refer to the local lesions and infections of the genito-urinary tract and organs, such as chancroid, lymphogranulomatosis and gonorrhea, and more especially the complications of these diseases. Syphilis, with the exception of secondary infection of pudendal lesions, is not adapted to treatment by sitz baths.

While the complications of venereal diseases comprise a great number of conditions benefited by this form of treatment, there are numerous affections in the urologic field which are relieved by this form of hydrotherapy.

To recount a few of the more common diseases there are first: marked varicosities of the pampiniform plexus and phlebitis of these veins. Then all the contusions to which the genitalia and perineum are subject to, and, hydrocele, hematocele and infiltration into the corpora cavernosa of the penis and urethra. The presence of fresh wounds and lacerations should interdict baths until after surgical treatment and time has elapsed for granulation tissue to form. I have not seen secondary infections from the baths after this period. I have found the hip bath helpful if such wounds are sluggish. The healing of incisions for perineal prostatectomy is stimulated by hydrotherapy. Non-specific epididymitis which occasionally occurs after instrumentation is amenable to hydrotherapy. There are stages in the local infections such as furunculosis, balanitis and erysipelas for which this treatment may be used.

It should not be assumed that this treatment can be used for each and every genito-urinary disease. Eczema, herpes, pruritus, neoplasms and tineal infections, to name the most common, are not suitable for this therapy. With regard to tuberculous infections of this region I have not found it to be of great value. The application of moist heat usually adds to the discomfort and does not favorably affect this disease. If open sinuses are present with secondary infections local baths may be judiciously employed with benefit.

Of the more deeply seated processes, like funiculitis, seminal vesiculitis, prostatitis, cystitis, orchitis and the neuralgias, — the vasodilatation, relaxation and analgesia obtained from the sitz bath gives grateful relief." . . . the colic pains . . . and violent constrictions of the tender membranous tubes (such as the . . . ureters and urethra) when they are blocked up and irritated by rough angular concretions," holds good today as in the days of Smollett two hundred years ago.

Sexual neurasthenia for which no organic basis can be found often responds well to hydrotherapy. However, such conditions, I believe are best cared for by competent psychiatrists.

Types and Methods

The object of any treatment is first to relieve the patient of his distress if possible; then to institute methods to free him of the disease. The warm sitz bath produces a dilation of the cutaneous vessels in the region affected by most genito-urinary diseases. A reflex dilatation of the iliac and pudendal vessels, analgesia, and increased blood flow through the pelvic parts, is produced.

We have found this procedure to afford great relief. Continuous warm lavage is favorable to the cleansing of the edematous ulcerations of chancroid. It promotes resolution of lympho-granulomatous lesions. However, it is in the treatment of the acute and chronic complications of gonorrhea that sitz baths find their greatest use. The burning urination, edema of the mucosa and tenesmus of the first days of acute urethritis are much relieved. The complications of posterior urethritis, epididymitis, and prostatitis are benefited by one-half hour sessions two or three times daily. Patients take willingly to this treatment because of its soothing effect.

In the management of genito-urinary diseases I use the common hip tub. The patient is instructed to seat himself in the tub; then to gradually bring the temperature up to his limit of comfort by means of the mixing valve at the side of the tub, and to remain there for fifteen to thirty minutes. I do not attempt any hard and fast rule as to length of time and exact temperature, but leave this to individual tolerance and comfort. Nylin[2] recommends a temperature for the cold sitz bath of 70 to 60 F. for a duration of two to four minutes. For that of the warm sitz bath 98 to 104 F. for fifteen to thirty minutes duration.

Conclusions

The warm sitz bath is a valuable adjunct in the treatment of the genito-urinary diseases. The equipment need be only the common hip tub. It gives great symptomatic relief to patients suffering from those diseases and their complications. The therapeutic effect of vascular dilatation, higher local temperature, increased blood flow and relaxation are favorable to recovery. It can be safely administered by the patient without danger.

(*Concluded on page 517*)

ARCHIVES of PHYSICAL THERAPY
OFFICIAL PUBLICATION AMERICAN CONGRESS OF PHYSICAL THERAPY

.·. EDITORIALS .·.

REFRIGERATION THERAPY IN CANCER

The history of medicine and particularly of physical medicine is replete with instances that clearly show a trend on the part of the profession enthusiastically to adopt at times new measures at the expense of the old and tried. Even today the mass of literary contributions point to thermotherapy in some form or another as a method which has captivated the minds of workers in various fields, so that one gains the impression that in the resulting hyperemia is centered the alpha and omega of treatment of a large variety of inflammatory and other pathologic processes. Owing to the fact that cold is known not to produce hyperemia in the sense of an immediate effect, the valuable reactions formerly obtained from methods of application commonly spoken of as hydrotherapy with special reference to the external application of cold, have fallen into disuse, which cannot be excused even on the ground that it involves technical procedures of a complicated and time-consuming nature. There is no doubt that in spite of the multitude of effective measures at present widely exploited there are positive indications for the management of a number of febrile affections in which old fashioned hydrotherapy associated with cold would still yield effects which in the past have justified the elevation of this branch of physical therapy to a high scientific level.

One needs only to recall the physiologic effects of cryotherapy, a term implying the application of certain levels of temperature below bodily norm, to realize its biologic potency and therapeutic properties. It should be recalled that when a human body is placed into a colder environment it loses part of its heat, a loss which can be artificially prolonged if this environment is sufficiently low in temperature and is maintained for an adequate period. While this effect acts a good deal like an antipyretic, it is known that under proper dosage the action of cold induces a state of stimulation. This stimulation which has been put to good advantage in medicine, if continued at greater intensity and longer exposure produces through contraction of the blood vessels and lowered metabolism a state of topical and general malnutrition which terminates into local gangrene (Troedsson[1]) and somatic death. Between these extremes it lies within the power of body adaptation to attain a stage of lethargic action even to the point of hibernation. Clinical and experimental tests have shown that this state produces effects on malignant cells as to imply that this age-old remedy under certain conditions may prove a therapeutic measure which merits fullest investigation. The basis for this concept is sound because it is physiologically established that cold may act not only as an antipyretic, tonic or stimulant but as a vasoconstrictor even to the extent of closing the blood supply of parts of the body and depress the biologic and pathologic activities of the cell.

Undoubtedly the most thought provoking contributions on this problem are the recent studies by Fay and Henry[2] with particular reference to the correlation of body segmental temperature in its relation to carcinomatous metastasis. These studies based on the principles above outlined have utilized a technic of refrigeration in a number of cases of advanced malignant metastases abandoned by unquestioned authorities as hopeless by any form

of therapy, in which certain methods involving the application of cold in the sense of refrigeration have produced not only alleviation of pain but temporary improvement of the general state of the patients and histologic changes in the primary and secondary growths, proved as such by microscopic and x-ray studies. When it is considered that Fay and Henry have succeeded in reducing pain, raising the nutritional state, and by inducing hibernation through irradiating the pituitary, thyroid and ovarian glands, attaining a fall of 29 per cent in the basal metabolic rate with a corresponding fall in segmental surface temperature, it is evident that these workers have provided us with a new application of an old agent the therapeutic possibilities of which in less hopeless cases may possibly revolutionize our management of many toxic, infectious and neoplastic affections.

When one further takes into consideration the cost both in time and economy involved in the application of radium or high voltage x-ray without adequate return in terms of recovery, then one should seriously interest one's self in a measure such as refrigeration which with certain modifications to suit varying conditions can be applied without the complicated and costly apparatus required in radiotherapy. Although cost is never a subject for scientific consideration it is nevertheless a daily problem each practitioner confronts and must be met in the interest of the overwhelming majority of our people who are economically in no position to avail themselves of measures involving a great outlay. It hardly needs pointing out that in spite of the possibilities of refrigeration therapy it is not to be accepted as a panacea or even as a substitute for surgical intervention with or without radiation, but should be regarded as an adjunct the indications and effects of which still require extensive investigation for its definite acceptance. While the simplicity of the method is a recommendation it should not be overlooked that its clinical application presupposes many precautionary measures and precise control in order to secure for it a definite place in therapy.

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EDUCATIONAL OPPORTUNITIES OF THE EIGHTEENTH ANNUAL SESSION

Comparatively few days are left before the opening of the next session of the Congress. On August 31 next the Instruction Seminar will be formally opened and continued for four full days. September 5 will see a reunion of the members of the Congress and many other physicians to profit from four consecutive days of scientific discussions and demonstrations in the field of physical medicine and allied sciences. This year's convention promises to be not only one of the most profitable but also one of the most enjoyable affairs in the history of the Congress, for it will afford all participants also an opportunity to visit the great World's Fair in the East and to meet outstanding leaders in physical therapy in their own scientific workshops. New York City has long been identified as the very cradle of American physical therapy, and of many distinguished names in this branch of medicine.

Of the Seminar little more need be said than its great value as a brief but fruitful postgraduate course sufficiently wide in scope to meet the daily needs

of every practitioner and progressive technician. It will not be confined to theoretic discussions for every effort has been made to visualize the scientific translated in terms of clinical application, which after all is the ultimate goal of the medical sciences.

Though the preliminary program has not only been published in the ARCHIVES but sent to interested colleagues through the mails, it may not be amiss to point out that it contains features of unusual clinical interest, and while the discussions will be opened by designated speakers who have been selected with especial regard for their qualifications, every member and visitor will be given an opportunity to air his or her views or submit questions with full freedom. In fact it is the wish and hope of the officers of the Congress that the profession at large will regard the sessions as an open forum with a view of clarifying any doubtful problems no matter of what nature. This applies to the general sessions as well as the various symposia and special technical meetings.

Considering the large number of papers to be read, it is exceedingly difficult to single out within the allotted space the many subjects which have been selected by the various essayists — all after careful scrutiny by a competent committee charged with the duty of assuring the audiences that they will hear only papers of distinct value and based on both experimental research and clinical experience. New methods of diagnostics by physical means, methods of raising the blood pressure in grave traumatic and other conditions, artificial fever therapy combined with autochemotherapy, the most modern methods of treatment by short wave diathermy with precise dosage control, the management of asthma, sinus disease, electric stimulation of degenerated nerves, refrigeration treatment of certain malignant and other conditions are a few of the subjects selected at random from the many, and mentioned here merely to convey a hint of what is in store to those who will devote all or part of the four days to the next convention.

Particular attention is called also to a veritable array of original and exceedingly informative scientific exhibits. No amount of description can convey an adequate idea of what a visit to this part of the Congress will bring to those who take a serious interest in the advances of physical medicine. It is enough to point out that even the most critical and progressive members of the medical profession will be amazed to learn how much original study and energy has been needed to make each individual exhibit outstanding in its respective field. Nor can one afford to miss the opportunity of closely scanning the industrial products that will be shown by the best firms that provide us with the best possible means of effectively applying the apparatus and instruments essential in the practice of physical medicine.

With what has been said it is or should be evident that the opportunity to attend the eighteenth annual session is one that no serious minded member of the medical profession interested in any one or many of the subjects above alluded to can afford to miss. A hearty welcome awaits all.

SCIENCE, NEWS, COMMENTS

Frozen Sleep May Replace Ether and Other Anesthetics

Frozen sleep may replace ether as anesthetic for surgical operations of the future. Instead of putting a smelly mask over the patient's face and telling him to "breathe deep" the surgeon of tomorrow may gently chill his patient to insensibility before getting to work with scalpel and needles. After the operation is over, the patient will be warmed back to consciousness without any unpleasant anesthetic after-effects.

Scientific evidence that this picture of future surgical operations is a distinct possibility appears in a report from Dr. G. H. Parker, Harvard University emeritus professor of zoology. (*Science*, July 21) Frozen sleep has long been used in the Harvard laboratories for operations, even extensive ones, on fishes, amphibians and reptiles, Dr. Parker tells fellow scientists.

Use of the same method of inducing unconsciousness before operations on humans is suggested, Dr. Parker says, by "press reports of a kind of cold hibernation induced in human beings by a slight lowering of their bodily temperatures."

This refers to the use of cold hibernation in treatment of inoperable cancer reported by Drs. Temple Fay and Lawrence W. Smith, of Temple University, Philadelphia, to the American Association for Cancer Research and the American Medical Association in April and May of this year. Without advocating the method as a cancer cure, but only as an aid in treatment, the Philadelphia physicians aroused the interest of fellow scientists in humans through refrigeration methods which cooled the body three to four degrees below its normal temperature of 98.6 degrees Fahrenheit.

The Harvard method of inducing frozen sleep, as Dr. Parker describes it, is similar to that used by the Philadelphia doctors, on cancer patients. At Harvard the fishes or reptiles are immersed for 10 to 15 minutes in water and cracked ice or cracked ice alone. They are then laid on cracked ice for the operation.

The animals at Harvard, Dr. Parker says, recover quickly and satisfactorily from their frozen sleep at the ordinary temperature of the laboratory and "the animals so treated may be almost at once tested in a particular way without waiting for the gradual disappearance from their systems of an anesthetizing drug." — *Science News Letter.*

Sulfanilamide, Wonder Drug, Now Cures 33 Diseases

Thirty-three different disease conditions may now be cured by the new chemical remedies of the Prontosilsulfanilamide-sulfapyridine group. In addition, these chemicals may be effective in preventing some of the ailments. Only in the treatment of colds and influenza are they apparently valueless.

The whole story of these amazing, new chemical remedies, what they can do, how they should be used, and their dangers is told for the first time by Drs. Perrin H. Long and Eleanor A. Bliss, of the Johns Hopkins Medical School, in a book just published for medical scientists by Macmillan. Drs. Long and Bliss were among the first to use these wonder-working remedies in the United States.

There are now, according to this book, eight drugs in the sulfanilamide group. They are: sulfanilamide itself, known also by the trade names of Prontylin, Streptocide, Prontosil Album and Lysococcine; Prontosil, also called Prontosil Flavum; Neoprontosil or Prontosil Soluble; benzyl sulfanilamide, also called Septazine and Proseptasine; sulfanilyl sulfanilamide, with the trade name of Disulon; sulfanilyl dimethyl sulfanilamide, called Uliron and Uleron; sulfapyridine, with the trade names of M & B 693 and Dagenan; and another compound known only by its chemical name 4,4'diaminodiphenylsulfone.

Sickness caused by two kinds of streptococcus germs, by the gonococcus, the meningococcus, and the pneumococcus has been successfully treated by these remedies. Recoveries from undulant fever, chancroid, typhoid fever, urinary tract infections, gas gangrene, chronic ulcerative colitis, trachoma, malaria, and the skin diseases, pemphigus and lupus erythematosus, have also been reported following treatment with one or another of these chemicals. In malaria, typhoid fever and undulant fever, the value of the chemicals has not yet been conclusively proved. Not many cases have been treated. Some doctors report good results and others poor results in these conditions.

Sulfanilamide, now used successfully as a remedy for childbed fever and gas gangrene, may become even more of a life-saver through use as a preventive of these serious illnesses. Drs. Long and Bliss believe any patient who suffers an injury which might result in the development of gas gangrene should be given prophylactic doses of the drug as soon as possible. Sulfanilamide also shows some promise of helping in the fight against rheumatic fever, the childhood ailment which affects the heart and causes many deaths among young people.

"Probably the greatest single instance of the misuse of sulfanilamide is in the treatment of the common cold," Drs. Long and Bliss declare. They explain that since colds and influenza are due to viruses, not bacteria, "there is little reason to believe that sulfanilamide will be of any value in the treatment of these diseases, and we strongly advise against its use in these infections."

So far, all that is definitely known about how sulfanilamide achieves its cures is that this and

related chemicals inhibit or check the growth of susceptible germs. A number of theories explaining the action of the chemicals in more detail have been proposed but, in the opinion of Drs. Long and Bliss, none of the theories adequately explains the action of the drugs.

Sulfanilamide and related compounds are not without danger. Stones in the kidneys are the most recently reported ill effect to follow one of these drugs, sulfapyridine. Few deaths, however, have followed the use of these drugs, except for the 76 or more which followed the tragic use of Elixir of Sulfanilamide Massengill. In these it was not the sulfanilamide but the deadly diethylene glycol, used as a solvent, which caused the fatalities. If proper precautions are taken in caring for patients receiving sulfanilamide or related drugs, serious ill effects will be noticed at their beginning, Drs. Long and Bliss state, and measures can be taken to lessen their severity and prevent a fatal outcome.—*Science News Letter.*

Control of African Sleeping Sickness Promised

African sleeping sickness, dreaded plague of tropical Africa, is rapidly being conquered by the chemical remedy, tryparsamide, and will probably soon be under "satisfactory control." This progress and the encouraging outlook for the future is reported by Dr. Louise Pearce, of the Rockefeller Institute for Medical Research at Princeton, N. J. Dr. Pearce was the first to show the beneficial effects of this drug on sleeping sickness cases in the Belgian Congo.

African sleeping sickness is caused by a germ called the trypanosome which is carried by the tsetse fly. It is a highly fatal disease, not to be confused with the encephalitis popularly called "sleeping sickness" in the United States and European countries.

The great value of tryparsamide over other drugs used to treat the ailment, Dr. Pearce points out, is that tryparsamide is effective as a cure in both early and late phases of the infection. Since it has been used in mass treatment the number of sleeping sickness cases has dropped markedly in various African colonies where efforts are being made to stamp out this age-old plague.

Other public health measures, directed against the tsetse fly and against uncontrolled movements and concentration of populations, are also playing a part in bringing the disease under control, but chief credit, Dr. Pearce indicates, belongs to the drug which cures patients and cuts down human sources of infections.—*Science News Letter.*

Adrenal Gland May Produce Hormone for Salt Control

A new discovery in the field of endocrine gland research appears in a report by Drs. Frank R. Hartman, Herbert J. Spoor and Lena A. Lewis, of Ohio State University (*Science*).

The adrenal glands, tiny cocked-hat-shaped organs close to the kidneys, produce not merely two but three hormones or chemical messengers, the scientists believe as a result of their latest investigations.

The newly-discovered hormone, the studies indicate, is responsible for keeping the sodium part of salt in the body. This important job has heretofore been attributed to the life-essential hormone from the outer part of the adrenal glands. Dr. Hartman previously obtained a potent extract of this hormone from the outer part of the glands which he called cortin, and which has saved many lives threatened by the adrenal gland disorder, Addison's disease.

He and his associates have now separated from this extract the substance which they believe is another hormone responsible for salt retention. This newly-discovered hormone, however, will not maintain life without cortin, although cortin will keep animals alive without the aid of the salt-controlling hormone.

First of the adrenal gland hormones is the familiar adrenalin or epinephrine produced by the inner portion of the glands. — *Science News Letter.*

Vitamin C Not Remedy for Rheumatic Fever

Anti-scurvy vitamin C, in citrus fruits, tomatoes, or other fruits and vegetables, is good for everyone but the idea that it is a specific remedy for rheumatic fever has been exploded by Dr. M. P. Schultz, U. S. Public Health Service expert on the rheumatic fever problem.

Children with rheumatic fever should not be forced to eat excessive amounts of the foods containing this vitamin, he warned, because they may then not eat enough of other necessary foods.

Rheumatic fever is the most common cause of heart disease in children, but the cause of rheumatic fever is still unknown. One theory is that lack of vitamin C in the diet is an essential factor in development of rheumatic fever. Studies disproving this theory are discussed by Dr. Schultz and associates in a *Public Health Service Report.* — *Science News Letter.*

Medical Prescriptions Can Soon Go International

Medical prescriptions, or at least the drugs that are called for in the prescriptions, are soon going international with the aid of the League of Nations. Which means, among other things, that if you are traveling abroad and need some more of that medicine the doctor prescribed for your stomach trouble, for example, you will be able to get the prescription made up without the difficulty you had last time you were abroad.

Even if you have never traveled abroad and do not expect to do so, you may benefit from the limited international pharmacopoeia which is now in process of creation.

A pharmacopoeia is a book containing a list of products used in medicine, with descriptions and chemicals tests for determining the identity and purity of the substances. The pharmacopoeia also contains formulas for certain mixtures of these

substances and usually a statement of average dosage. The Pharmacopoeia of the United States is a legal standard for drugs and medicines in this country. Other nations have their own.

There is considerable variation in the strengths and composition of medicinal preparations as given in the different national pharmacopoeiae. This creates confusion not only in the case of the individual who needs to have a prescription filled when traveling in foreign lands, and with regard to treatment of ships' crews calling at different ports and replenishing of ships' medical chests, but also for manufacturers supplying the international market and for physicians investigating the value of a new treatment developed in a foreign country.

The move for an international pharmacopoeia to solve these difficulties started in Brussels in 1925. Material for it has been prepared and in May of this year a technical commission of experts, set up by the Health Organization of the League of Nations, will consider this material and approve a final form of what may then become the international pharmacopoeia. — *Science News Letter.*

Tuberculosis Germ Produces Anti-Bleeding Vitamin K

The tuberculosis germ, often a cause of severe and fatal bleeding, may shortly give doctors a weapon against bleeding.

This surprising possibility of good coming from the White Plague seems promised by the discovery that the yellow crystals which give the TB germ its color are a form of vitamin K, called the anti-hemorrhagic vitamin because it prevents or checks tendency to fatal bleeding in obstructive jaundice.

The discovery, by Drs. H. J. Almquist and A. A. Klose of the University of California at Berkeley, is reported in the *Journal of the American Chemical Society.* (June.)

Although the germs in the tuberculosis patient's body make this life-saving chemical which is both coloring matter and vitamin, the patient cannot get it from the germs that are making him sick and boring through his blood vessels to cause hemorrhage. Nor would it do him any good if he could, because lack of vitamin K is not the cause of hemorrhage in tuberculosis, and the TB patient does not suffer from lack of blood-clotting substance. Patients with obstructive jaundice, the ailment that turns the skin yellow, do suffer from lack of the blood-clotting substance because in their condition the flow of bile to the intestines is blocked. Without bile, the patient cannot absorb vitamin K from his food.

Fortunately, however, the chemical has been extracted from the TB germs and has ever been made synthetically by Prof. R. J. Anderson of Yale University, who christened it phthiocol. The California scientists used some of Prof. Anderson's synthetic phthiocol in their experiments.

"The compound has been definitely shown to be a form of vitamin K," they state.

It has physical and chemical properties similar to those known for vitamin K. Fed to chicks with a vitamin K-less diet, the synthetic TB chemical kept the clotting time of the chicks' blood from being dangerously prolonged just as vitamin K itself would.

"This discovery essentially completes the vitamin K problem," the California scientists state, adding that they believe phthiocol is probably the simplest member of an homologous series of antihemorrhagic substances.

Their discovery of its identity as vitamin K is considered an amazing outcome of the tedious and even dangerous chemical studies of tuberculosis germs which Prof. Anderson has been making for 10 years under a grant from the National Tuberculosis Association, made possible by Christmas seal sales.

Sex Hormones from Bees May Affect Vertebrates

New evidence that biologically "we are all members one of another" comes out of the beehive. What seems to be a female sex hormone, or gland secretion that powerfully influences the development of the reproductive capacity, produced by worker bees, has been shown capable of effects in animals so remote from the bee world as rats, and therefore presumably on other mammals as well.

The evidence is reported by Dr. Henry L. Heyl of The Children's Hospital, Boston. He found that a chemically prepared extract of royal jelly, the special food given only to bee larvae destined to become queens, when injected into the bodies of immature female rats caused a precocious development of the tissues of their ovaries directly surrounding the egg cells.

Royal jelly is a most peculiar stuff. It is secreted in glands in the mouth of the worker bee. Fed to female bee larvae in a still-undifferentiated state, it causes them to mature rapidly and become full-fledged females or queens, with functional reproductive glands. The other female larvae, comprising the vast majority of the brood, receive royal jelly for only the first three days and develop into workers, which are female insects with undeveloped ovaries and under ordinary circumstances incapable of producing eggs.

Although the royal jelly confers upon the queen bee the power to become the mother of the hive, it does not seem to carry with it the gift of the so-called maternal instinct. Says Dr. Heyl, "The worker exhibits many maternal instincts, the queen none." These insect spinsters not only serve as nurses for the offspring of their larger, fruitful sister; they even produce the wonder-food that makes queens of some of her daughters, though they receive no benefit of it themselves.

This apparent production by bees of a hormone that can influence the development of mammals and other vertebrates is a new piece in a modern biological puzzle that becomes increasingly complex. Female animals produce male hormones, male animals produce female hormones, and animal hormones characteristic of both sexes have been found in plants, even in some of the lowest forms. Physiologists still have a lot of explaining to do.— *Science News Letter.*

Obituary

Dr. Emil Vrtiak 1890 - 1939

It is with profound sorrow that we announce the sudden and untimely demise of Dr. Emil Vrtiak, Associate Professor of Clinical Medicine, Rush Medical College of the University of Chicago, whose contributions to the ARCHIVES have aroused the admiration of the profession throughout the world. An outstanding internist, his comparatively brief life has been full of rich achievements in the domain of clinical medicine and notably in the rheumatic and arthritic states, in which he was accepted as an authority. His clinic at Rush was one of the largest in the country and his classes were always fully attended by an enthusiastic student body who appreciated his scientific acumen and brilliant exposition of the difficult and manifold problems pertaining to arthritis. Medicine has sustained a great loss in the passing of this earnest and brilliant clinician. The Congress and the editorial staff of the ARCHIVES extend to his bereaved family their heartfelt sympathy in their irreparable loss.

Dr. Buenaventura H. Portuondo 1866-1939

It is with sorrow that we announce the demise of Dr. B. H. Portuondo on March 9 of this year. Dr. Portuondo was born in 1866, was graduated from Columbia University College of Physicians and Surgeons in 1899 and practiced in Belleville, Illinois. He was a Fellow of the American Medical Association and of the American Congress of Physical Therapy. He served as a medical officer in the World War. Deepest sympathy is extended to his bereaved relatives.

Value of Sitz Baths in Genito-Urinary Diseases — Ferguson

(*Continued from page 510*)

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2. Principles and Practice of Physical Therapy, Hagerstown, Md., W. F. Prior Co., 1934, edited by Mock, Pemberton and Coulter, Chapter 20 in Volume III, "Hydrotherapy," edited by J. B. Nylin, p. 47.

Discussion

Dr. E. O. Swartz (Cincinnati): The author has so completely covered the ground that he has left us little to do but to congratulate him and agree with his conclusions. It is a presentation of a simple procedure which can be used in almost any home, or in any hospital and one that will give results by lessening spasm, pain and discomfort. It is a procedure that promotes resolution, absorption of exudates, and the healing of wounds. It requires no expensive or complicated apparatus. Skilled technicians, while valuable, are not essential, even the thermometer may be omitted and the feeling of the patient, if conscious and rational, taken as a guide for the thermal high point. The organs involved in the pathologic processes are not easily injured by moist heat and the processes are favorably influenced by prolonged heat.

The indications are legion. The simplicity of the procedure with its small expense appeals to the patient and after the first bath (except those cases in our charity hospitals who have a congenital aversion to baths) the patient is usually anxious for the next treatment. In one of our large hospitals "conscientious objectors to the bath" were persuaded to take them by making the next meal contingent on a properly taken sitz bath.

In the Urological Service at the Cincinnati General Hospital sitz baths are used routinely in almost all acute inflammatory lesions of the lower urinary tract except in definite contraindications, such as grave constitutional, cardiac or vascular disease. Also chronic fistulae, strictures of the urethra and healing perineal wounds are treated with hot sitz baths as adjuvants to appropriate surgical measures. These are given once or twice a day. The temperature is a little higher than that advocated by Nylin, often going to 115 or 120 F. The reaction of the patient is a better guide than the thermometer. The duration is fifteen to thirty minutes and is usually followed by relaxation and relief from pain. If the patient complains of weakness or vertigo the bath should be shortened or discontinued.

The relaxing effect of the treatment frequently renders impassable strictures of the urethra permeable to filiform bougies. We feel these results can be obtained in many cases which otherwise would require surgery. We are quite sure that by the use of topical baths the duration of acute infectious processes other than tubercular, is decidedly shortened. We do not use the sitz bath in neoplastic disease, in eczema or parasitic skin infections. We do not believe this simple procedure is a cure-all but a valuable, reliable therapeutic agent in surgical conditions of the lower urinary tract. Its simplicity recommends it, and the results attest its effectiveness.

THE STUDENT'S LIBRARY

EDUCATION OF THE HANDICAPPED. Volume One. HISTORY. Edited by *Merle E. Frampton*, Ph.D., LL.D., Professor of Education, Teachers College, Columbia University and *Hugh Grant Rowell*, A.B., M.D., Assistant Professor of Education, Teachers College, Columbia University. Cloth. Price, $2.40. Pp. 260. New York: World Book Company, 1939.

For the guidance of programs of the education of the handicapped for the present and the future it is important to have a historical review of the factors and influences which have conditioned the destiny of the handicapped. This story on the pages of world history is often tragic and pathetic. The study of the history of the handicapped is a study of the history of human progress and social evalution. The authors believe that the program of the future for the care and education of the handicapped must rise from the trials, errors and victories of the past and present. There are chapters on the visually handicapped, the hypacusic, the handicapped in speech, the crippled, the tubercular, the cardiac, the mentally and socially handicapped. This monograph will be of great service for the student and the worker in the field of the education of the handicapped as well as others desiring an insight into this interesting phase of our socionomic history and its circuitous progress throughout recorded time.

THE GENUINE WORKS OF HIPPOCRATES. Translated from the Greek by *Francis Adams*, LL.D., Surgeon. With an Introduction by *Emerson Crosby Kelly*, M.D. Cloth. Pp. 384 with 40 illustrations. Price, $3.00. Baltimore: The Williams & Wilkins Company, 1939.

This volume offers an authentic translation from the Greek of the genuine works of Hippocrates. The introduction by Dr. Kelly sketches in broad strokes the more or less legendary personality of Hippocrates II, an individual who lived in the Golden Age of Greece and practiced the art of healing at the famous health resort—medical school and hospital—on the Island of Cos. Most physicians though vaguely recalling the contents of the oath of Hippocrates, are definitely convinced that its moral stipulations are as high in their ethical implication as are the Mosaic Commandments brought down to posterity from the heights of Sinai. The classic era of Greece has left its imprint upon the succeeding periods of civilization because it dedicated its thoughts and action more to things temporal than to things spiritual. It is therefore not surprising to observe that the teaching and practices of Hippocrates as expounded in the seventeen listed chapters are distinctly utilitarian in intent. Throughout this the most classic of medical observations one notes that Hippocrates leans toward the methods that are of proven or practical value and toward those in the medical guild that practice their profession with dexterity and assurance. The inspirational qualities of this book soon become apparent to all progressive students of medicine because they touch upon problems that are as practical today as they were in the dim yesterdays. It is a document whose contents are as fascinating and important to modern medicine as the biographic sketches of Plutarch are to history or the other immortal contributions of those extraordinary and clear visioned Greek philosophers, dramatists and poets whose lives left an imperishable impression on the period in which they worked, suffered and died—a golden heritage to mankind. Astonishing it is that after a period of 2500 years one still attempts to define the art and practice of medicine; the meaning and influence of weather and seasons on the patient; the treatment or regimen of acute disease; the importance of prognostication; the control of epidemics; the utility of surgery, and the like. This is a work that must be in the library of every serious and progressive student of medicine because it is not only one of the earliest testaments of ethical practice, but an important historic document of great clinical value to the undergraduate medical student.

LIFE'S BEGINNING ON THE EARTH. By *R. Beutner*, M.D., Ph.D., Professor of Pharmacology at the Hahnemann Medical College and Hospital of Philadelphia. Cloth. Pp. 222 with 79 illustrations. Price $3.00. Baltimore: The Williams & Wilkins Company, 1938.

Science has continuously been attempting to discover the riddle of how life began on earth. The answer to this has yet to be accepted, though attempts to do so have enlisted the interest of the greatest scientists, philosophers and metaphysicians. Professor Beutner has for long been recognized as one who has advanced some very challenging observations and hypotheses in this direction. His earlier book on the physical chemistry of living tissues and life processes suggested that to understand life, it would be necessary to synthesize enzymes because they tend to reproduce themselves in a natural environment. Much that was speculative in the field of chemistry a decade ago and even hypothetical to the author himself has been made clearer by the advances in this field. Accordingly the entire conception of life and its beginning stems from the theory that to understand life one must prove its manifestations under the methods familiar to the chemist. The book follows this direction and attempts to find the answer by examining the latest data on the chemistry of virus, crystalline growth, osmotic pressures and structures, and the elements of motion. The author evaluates all the possible forces and data that are said to act on the living organism. His experiments often duplicate in the

test tube an imitation of life's processes and therefrom he attempts to draw certain conclusions suggestive of the methods employed by Nature to produce life. It is difficult to say whether Beutner deals with scientific realities or its counterpart, but it is certain that he is stimulating and provocative in his discussions. He attempts to draw certain lessons from the nature of vital growth and crystallization; he points out the intimacy of carbon as the most important property related to life; the importance of salt and water for life and growth and the fundamentals of the mechanism of motion in uni- and multicellular organisms. The exposition is as fascinating as is the very topic, and no one can present today a more authoritative argument nor present more pertinent data on the chemical and biophysical nature of the structure that bridges the chasm between life and lifeless phenomena than the author of this volume. His style is vigorous, brilliant and courageous in the presentation of facts about Life's Beginning on the earth.

MODERN SURGICAL TECHNIC. By *Max Thorek*, M.D., K.L.H. (France); K.C. (Italy). Professor Clinical Surgery, Cook County Graduate School of Medicine; Attending Surgeon, Cook County Hospital; Surgeon-in-Chief, The American Hospital, etc. Foreword by *Donald C. Balfour*, M.B., M.D., LL.D., Head of Section in Division of Surgery, The Mayo Clinic; Director and Professor of Surgery, The Mayo Foundation for Medical Education and Research, Graduate School, University of Minnesota, etc. Three volumes. Cloth. Pp. 3000 with 2174 illustrations, originals principally by W. C. Shepard. Price, $30.00. Philadelphia, London, Montreal, New York: J. B. Lippincott Company, 1938.

These three volumes represent the author's *vade mecum* to the problems of modern surgical technic. Therein he has attempted the laborious task of cultivating a terrain in the field of surgical publications between those whose scope is encyclopedic, or limited to the space of a single book. The author's reason for this undertaking is based on his personal impression that present day surgical systems with their wealth of material and multiplicity of procedures tend to confuse, and that the single text with its abridged material is an impractical guide for surgeons and students. Such a charge must be regarded as invalid because data and detail are as essential to the orientation of the special student as are the teaching of principles and practice to the novitiate in surgery—a view supported by outstanding educators and surgeons. Perhaps the best justification for the author's laudable ambition to present his own crystallized opinions lies in the fact that certain individuals in every age often are able to see the technical nature of the problems in their special field from a vantage of a rich experience, which permits them to present their views in a lucid and succinct manner. Such labors therefore must be reviewed not because they have abridged the larger volumes nor added to the breadth of the single ones, but that they offer the ripened opinions based on thirty years of assiduous work in surgery, and has attempted to clarify and emphasize the problems of modern surgical technic in as concise a fashion as is permitted by the scope of such an undertaking. This the author has accomplished with no small degree of success, and though certain viewpoints and errors will no doubt be challenged, the work as a whole merits praise as a contribution of a practical and artistic nature.

The text proper is arranged into six major sections and these in turn divided into forty chapters. The foreword by Balfour indicates the tremendous progress of surgery in the past fifty years and commends the author for the success of his comprehensive efforts in affording the profession an opportunity to benefit from his clear and authoritative work on modern surgical technic. Each section is provided with an orientation text, which points out the historic and special background and direction of the intended discussions. The first part of volume 1 deals with the general considerations of the surgeon's art, his patient, the hospital and operating room arrangements and requirements and the subject of anesthesia. The second part discusses surgery of the head and neck and plastic intervention. Volume 2 expatiates on the surgical problems of nerves, vessels and bones, and concludes with an equally impressive exposition of the modern technics and advances in the operative management of surgical conditions of the breast and chest. Volume 3 includes discussions of the surgical approach to the numerous and difficult problems related to surgery of the abdomen and that of the pelvic region.

When it is realized that this treatise includes over 3000 pages of highly technical and no doubt critically selected material, through which are interspersed 2174 illustrations by artists of fame, on paper whose quality is as high as is the artistry of the drawings, one comes close to an appreciation of the tremendous energy and cost expended in the consumation of this task. These sacrifices arouse the admiration and sympathy, because they have resulted in a contribution borne out of mental dystocia the suffering from which transcends average knowledge. The work is impressive not only because of its wide scope, detail and artistic format, but because it has attempted to present the views of past and present authorities as well as the author's personal experience in a lucid and succinct style. The clipped sentence and outline style introduced in the text lend themselves admirably to the ready comprehension of technic. It is an exchange of the flexibility of thought for the lucidity of expression, but has the objection of often making opinion too dogmatic at the sacrifice of fact. An example in point is the author's abrupt discussion and misstatements regarding the historic origin and the work of the pioneers in electrosurgery. Not only has he failed to mention the work of the earliest pioneer, Riviere, but credits electrodissection to Clark instead of Wyeth, and attributes to Wyeth the coining of the terms medical and surgical diathermy instead of Nagelschmidt, and the like. Because the author is a disciple of electrosurgery and especially because he has of recent years been in the forefront of those reporting the favorable effects of surgical diathermy makes it all the more desirous that his work on this feature of modern surgical technic be free from error and statements that have

no existence in fact. While no work is free from certain errors, described by Anatole France as the literary nits and lice, the above mentioned constructive criticism is presented in the hope of transforming an impressive work into a perfect contribution.

ORTHOPEDIC APPLIANCES: The Principles and Practice of Brace Construction for the Use of Orthopedic Surgeons and Bracemakers. By *Henry H Jordan*, M.D. Foreword by *E. G. Brackett*, M.D., Editor of the *Journal of Bone and Joint Surgery*. Cloth. Pp. 412 with 176 illustrations. Price, $4.00. New York, London, Toronto: Oxford University Press, 1939.

A thorough knowledge of the use and application of braces and plaster-of-Paris is essential as a part of the orientation of the orthopedic and traumatic surgeon and the physician specializing in and in charge of a physical therapy department. The proper use of orthopedic appliances often may make the difference between success or failure of physical therapy. The mechanical as well as the clinical principles involved must be understood in order that the physician may select and apply accurately any brace to perform the function for which it is intended. This work offers a liberal education in the uses of orthopedic appliances. It contains chapters on plaster-of-Paris technic; spinal braces; lower back braces, sacro-iliac belts and abdominal supports; orthopedic appliances for the lower extremities; foot braces, arch supports and foot plates; orthopedic appliances for the upper extremity; and also one on the use of roentgen rays in the construction of orthopedic appliances. The book is profusely and excellently illustrated with 387 single illustrations in 176 cuts. While recent American and English literature shows a number of articles on orthopedic appliances, this is the first book in English that has appeared on this subject. It should be in the library of every physical therapy department treating orthopedic and traumatic surgical cases.

REFRACTION OF THE HUMAN EYE AND METHODS OF ESTIMATING THE REFRACTION. By *James Thorington*, A.M., M.D., F.A.C.S. Third Edition. Revised and Edited by *J. Monroe Thorington*, B.S., M.A., M.D., Associate Ophthalmologist, Presbyterian Hospital, Philadelphia. Pp. 412. 283 Illustrations, some Colored Figures. Washable Fabric. Price, $3.50. Philadelphia: P. Blakiston's Son & Co., Inc., 1939.

Several books on refraction have been published in recent years, but it is doubtful whether the student of ophthalmology has looked forward to any of them with the same enthusiasm as Thorington's. For several decades this volume has been a guide for the beginner as well as the advanced student of refraction. The original plan of the book has been preserved. It deals with the problems of refraction in a practical way, omitting the more complicated and confusing mathematics, which while important is hardly ever sufficiently understood. Refraction has not changed in technic, but some refinements are constantly being added. As in the original work, retinoscopy and ophthalmoscopy are given due consideration. Sections are devoted to muscular insufficiencies and orthoptic training, the evaluation of which must be left to the ophthalmologist. Final chapters describe various types of optical lenses, with reasons for their selection, together with methods of measuring and fitting. This third edition appears in a new format, the text having been thoroughly revised to embody recent advances. Some new illustrations are also added in this edition. It is hardly necessary to say that Thorington continues to be the classic on refraction, an assertion which renders any recommendation by the reviewer superfluous.

INTERNATIONAL ABSTRACTS

Exposure of Body to Unequal Temperature. C. W. More.

Minnesota Medicine **22**:1 (Jan.) 1939.

More has noticed that many typhoid patients and children with pneumonia occupied beds or cribs placed so that the temperature on either side was uneven. For example, one side of the bed was next to a window with a source of heat coming from the other side. So emphatically was it impressed on the author that unequal temperature is an etiologic factor in pneumonia that, when building a small hospital, he had the windows and doors to the rooms and wards placed opposite each other, leaving ample wall space for beds without exposing the patients to unequal temperatures. Pneumonia has never developed in patients entering the hospital with early typhoid and free from lung complications. At one time during an epidemic of typhoid fever the hospital ward was overcrowded and a patient occupying a bed next to a wall *22* feet from a double windod was observed to be coughing. While examming this patient the author distinctly felt a draft of air on the back of his head and neck. There was a breeze coming through the top of the windows, *22* feet away and was directed toward the ceiling by a contrivance at the top. The wind followed the ceiling and continued down the wall where the patient was. His position was immediately changed and he recovered promptly. The author has a patient who will sneeze if he leaves a warm room and walks outside while a cool breeze is blowing, and his nose will begin to discharge. But if he will turn round so that all parts of his chest are cooled equally, this condition soon stops. Some individuals are more susceptible to this unequal temperature than others. In children with pneumonia whose parents can not or will not protect them from unequal temperature, the pneumonia jacket, frequently changed, is most useful, chiefly because it maintains an equal temperature. Those advocating cold fresh air for children with pneumonia place them in cold rooms. Here the patients get the benefit of fresh air without exposure to unequal temperature. The author concludes that exposure of the body to unequal temperature is a predisposing etiologic factor in pneumonia as well as the cause of so-called "colds in the head," coryza, tonsillitis, pharyngitis and the like. — [Abst. J. A. M. A. **112**:1197 (Mar. 25) 1939].

Warts and Moles. M. J. Reuter.

Wisconsin M. J. **38**:207 (Mar.) 1939.

Warts may be removed by fulguration. This treatment consists in the local application of the high frequency spark by a pointed metallic electrode. A stream of sparks flows from the point of the electrode into the wart. The action of the spark is caustic. The amount of destruction can be controlled, depending on the strength of the current and the duration of its application. Under local anesthesia, a few seconds application is usually sufficient. The wart becomes dry, hard, brittle and a blister forms about the border. The desiccated tissue is removed with scissors or curette without bleeding, and then the base or papillary portion of the wart is fulgurated lightly.

Annoying warts are those that occur on the bearded region. Mild fulguration is a convenient method of removal, but as they spread rapidly, repeated applications are necessary.

Moles may be removed by excision, cauterization or fulguration. Freezing with carbon dioxide snow is often satisfactory. Fulguration under local anesthesia is a very useful method. Initial treatment should be deep enough to destroy the epidermis and the superficial dermis. This insures destruction of the melanoblasts (pigment-producing cells) located at the epidermo-dermal junction, which are the cells concerned in the production of malignant melanoma. Melanoma is a malignant neoplasm of melanoblastic cells and originates from the melanoblasts at the epidermodermal junction. While malignant melanoma may arise from a nevus, contrary to prevalent opinion it probably arises from normal skin more frequently than from a pre-existing mole.

Pathogenesis of Hemorrhage in Artificially Induced Fever. Sloan J. Wilson, and Charles A. Doan.

J. A. M. A. **112**:877 (Mar. 4) 1939.

Petchial hemorrhages have been one of the most constant pathologic observations following artificially induced fever. Necropsy on experimental animals and human subjects following lethal fever has revealed extensive hemorrhages and hepatic damage. The mechanism has been attributed to anoxia. In the present survey the influence of fever on the circulating blood platelets, prothrombin and fibrinogen have been studied in experimental animals and in the human subject as possibly important additional contributing factors. Total platelet counts, qualitative and quantitative studies of megakaryocytes in serial sternal marrow punctures, quantitative determinations of prothrombin and fibrinogen and histologic studies of the liver have been made. The hemorrhagic diathesis has been found to be directly proportional to the degree of damage occurring in one or both of these essential factors in the coagulation mechanism.

Regulation of Radioactive Waters.

New legislation provides for strict regulation of the advertising of the products of those medicinal springs which are entitled to be termed radium baths. Proprietors of such springs are required to measure the radioactivity of all spring water and other medicinal products which are advertised as radioactive. These tests must be made at regular quarterly intervals corresponding to the seasons of the year. All advertising matter relative to radioactive therapeutic substances must contain exact data on the radioactivity of the products. The proper figure should be reckoned as the average of at least four measurements made within a certain year and at all seasons of the year. Thus it is not permissible to furnish data with regard to medicinal springs which, although literally accurate, fail to take into account the natural variations in radioactivity. — [Foreign Letters, J. A. M. A. **112**:1274 April 1) 1939.]

Splenic Volume and the Polycythemia of Artificial Fever in Intact, Unanesthetized Dogs. Laurence L. Palitz.

Am. J. Physiol. **125**:607 (Mar. 1) 1939.

Palitz summarizes his studies by pointing out that artificial fever induced in dogs by inductothermy causes a significant contraction of the spleen. This contraction is responsible for the observed polycythemia and the blood plasma concentration since neither of these effects occur in splenectomized animals. It is further shown that absolute increase of red cells, produced experimentally in acute dogs by transfusion of blood corpuscles, results in increase of serum protein, due possibly to loss of water into the tissues.

Intrapleural Pneumonolysis by the Closed Method. Ralph C. Matson.

Am. Rev. Tuberculosis **39**:162 (Feb.) 1939.

The following case illustrates the technic: Intrapleural band adhesions can be operated by electrosurgery and is highly recommended by Matson. Under thoracoscopic vision and infiltration, an adhesion was severed with a moderately damped current at a point 2.5 cm. from the vessel. The current was seen to pass up to the point of the infiltration, but not beyond it. The cutting was clean and the field dry. The author prefers electrosurgery to galvanocautery.

Associated with the enormous reduction of exudate formation (serous exudate 3.9 per cent). The source of blood in the few cases of haemorrhagic exudate was not from bleeding of severed adhesions, but from the first chest-wall puncture for introducing the thoracoscope, where a small quantity of blood ran down the inner chest-wall as the trocar and cannula for the thoracoscope passed through the pleura. Severe febrile reactions were rare. Bronchopleural fistula occurred only six times in 179 cases (3.8 per cent); spontaneous pneumothorax three times, (1.6 per cent); there were no instances of shock, gas embolism nor severe surgical emphysema. Likewise, no direct operative mortality occurred in the entire series; only one death followed for which the operation was possibly indirectly responsible, and this single mortality was due to a spontaneous pneumothorax on the contralateral side during a severe asthmatic paroxysm seven days after operation. Excepting three profuse haemorrhages early in the author's work, there were no serious sequelae. Records of the results of treatment in a series of 350 cases showed 70 per cent had been clinically successful, that is, the unsatisfactory pneumothorax was converted into a satisfactory one and all the patients returned to working capacity with a negative sputum; whereas, before operation 90 per cent had a positive sputum and 85 per cent were bed cases.

Pemphigus Controlled by Vitamin D. Howard King and C. M. Hamilton.

Arch. Dermat. Syphil. **39**:515 (Mar.) 1939.

In 1932 Ludy reported 6 successive cases of pemphigus in which the condition was apparently cured by large doses of viosterol and ultraviolet ray therapy. His results led to the trial of concentrated viosterol in this case. The authors present a case of pemphigus treated with high concentrations of vitamin D. With the institution of this concentrated vitamin D therapy, the patient began to improve at once, and was ultimately relieved of symptoms. Vitamin D was given in capsules containing 50,000 U. S. P. units each. Administration of the vitamin in doses of 300,000 to 400,000 units a day for three or four weeks controlled the cutaneous lesions but caused disagreeable symptoms (nausea, slight epigastric distress, mental apathy and general weakness). When the dose was reduced to 50,000 or 100,000 units the patient remained both free of cutaneous lesions and without symptoms of hypervitaminosis. Eleven months after discontinuation of the therapy, there has been no recurrence of the disease and no ill effect from the treatment.

The Action of Alternating Currents Upon the Electrical Excitability of Nerve. J. Reboul and A. Rosenblueth.

Am. J. Physiol. **125**:205 (Feb.) 1939.

That alternating currents (a. c.) may modify the electrical excitability of nerve not only at the region of application but also in neighboring segments was shown by Wedensky in 1903. In a study of some effects of alternating currents on nerve, observations have been made which confirm and extend Wedensky's classical report. This report shows that applications of weak a. c. to a nerve decrease locally the electrical excitability. Stronger currents lead, on the contrary, to increased excitability which may be followed by a delayed decrease. The frequency of the a. c. and the length of application influence the results obtained. The effects are maximal at the poles and decrease with the distance from these poles. Different segments of the nerve may show

opposite changes of excitability. Reboul and Rosenblueth conclude that a. c. exerts two independent opposite effects on excitability. These effects are not correlated with the effects of a. c. upon nerve conduction. The influence of the intensity of high frequency a. c. on the muscular responses to the a. c. is described. These results support the previous conclusions of other workers.

Fever Therapy in the Treatment of Syphilis. A. J. Kotkis.

J. Missouri M. A. **36**:57 (Feb.) 1939.

In private practice the choice of the most suitable agent for the production of artificial fever is the problem of the physician in charge of the patient. The questions of (1) period of hospitalization, (2) comfort to the patient, (3) control of the rising body temperature, and (4) the possibility of correlating chemotherapy with fever therapy must be given serious consideration.

Artificial fever (hyperthermia) by means of an approved fever cabinet with a recognized technical routine offers a method with the least element of risk, greatest comfort to the patient and a minimum of hospitalization. Each treatment is one day treatment with an overnight stay in the hospital. The intervals between treatments may be used for chemotherapy. In the hands of trained personnel, the height of the fever curve (from 104 to 106 F.) and the length of its duration (usually from three to six hours) can be maintained and controlled with remarkable exactness. The contraindications embrace generalized arteriosclerosis (50 years of age — upper limit), advanced organic brain disease, organic heart disease, only when decompensated, any stage of heart block, diabetes, advanced interstitial nephrosis, acute nephritis, organic nerve disease resulting in complete anesthesia, pregnancy, marasmus and dementia.

Medically Supervised Vacational Migrations. Charles I. Singer.

J. A. M. A. **112**:905 (Mar. 11) 1939.

It would be inadvisable to transplant European methods of treatment and medical economics to our country. It would be short sighted, however, to fail to exploit some of the conclusions of centuries of empiric continental medicine. A bigger mistake would be to leave unnoticed the results of painstaking biologic research of the European climate. No doubt the handbooks of European balneology and climatic therapy place too much importance on technical detail, offering too many hydrotherapeutic prescriptions.

To develop the modern American climatic therapy, the following steps seem to be important: (1) an inventory of our natural resources, (2) development of institutions and (3) education of (a) a new type of specialist, (b) the general practitioner and (c) the public. Nature did not bestow all its natural resources on Europe, for it has no Florida, California, Nevada or Colorado and nothing like Yellowstone Park, with its mineral thermal springs and mud volcanoes. America is fortunate to find within its boundaries an array of specific climatic types, all types of seashores from Nordic to subtropical, high altitudes and deserts. But the biologic effects of our different climatic types have to be evaluated. Our thermal mineral springs, muds and moors must be standardized; indications and limitations must be determined and unwarranted claims must be weeded out.

Combined Use of Chemotherapy and Artificial Fever in Neurosyphilis. Frank M. Adams.

J. Arkansas Med. **35**:166 (Feb.) 1939.

Fever produced mechanically offers several advantages over malarial therapy. Electropyrexia requires no hospitalization. Fluctuation in temperature can be controlled within small limits. Potent drugs can be employed during the actual production of fever. The danger of a fatality is considerably lessened. Its chief disadvantages are that it is expensive, its correct operation requires a trained technician, and most important of all, it is a relatively new therapy and enough time has not yet elapsed for a long-period, follow-up study.

However, the production of artificial fever in humans by mechanical means can no longer be considered as an experimental procedure.

During the past eight months fifty patients with various diseases were given a total of 256 hyperthermic treatments. There have been no fatalities. Severe reactions have been conspicuous by their absence. Only one patient has been removed from the cabinet before the termination of the treatment, and this was a highly nervous woman who has since taken a total of eleven treatments without difficulty. Intravenous glucose has been used only once because of a threatening peripheral vascular collapse near the conclusion of the treatment.

Of the 50 patients 18 had some form of neurosyphilis. These patients have received a total of 105 sessions of fever (a total of 420 hours of fever ranging between 104.5 and 106 F.) The average patient has received only twenty-three hours of fever. This we do not consider an adequate amount in the treatment of neurosyphilis. All patients have the understanding that fifty hours of fever is the therapeutic goal. To date only two patients with neurosyphilis have completed a sufficient number of hours in the fever machine.

The Pharmacology of Short Waves.

Hildebrandt conducted investigations of the pharmacology of short waves. Previously only an increased effect in the tissue was demonstrated. Since it is to be assumed that chemical processes are also produced, the author first examined the histamine content of the blood after treatment with the short wave apparatus according to

Schliephake's method (wavelength 3.5 meters). These experiments were performed on dogs; the thorax was exposed to the short wave current one-half to one hour. At various intervals within the next twenty-four hours specimens of blood were taken and the histamine content was determined. In some of the animals an increase of several hundred per cent was observed to take place directly and a return to normal would occur within the next two to four hours. In others the histamine value was not elevated immediately, but rather the maximum was reached after some two hours and the return to normal value then ensued gradually in the next few hours. Diathermic tests yielded virtually the same results. Accordingly the influence of the histamine content of the blood must be attributed to the pronounced thermic effect of the short wave current. The histamine values should be rather large, since tests in which single injections of histamine were used in doses of 0.1 mg. per kilogram of body weight disclosed that the histamine had disappeared quantitatively from the blood at the end of the five minutes. — [Foreign Letters, J. A. M. A. **112**:1974 (April 1) 1939.]

The French League Against Rheumatism.

In a third paper Surmont and Michon outlined the various types of physical therapy. For the localized forms of chronic gonorrheal arthritis, radiotherapy to combat the inflammatory reaction should be given. For the more generalized forms with an acute or subacute onset, pyretotherapy with a temperature to 41 C. (105.8 F.) is indicated. When the onset has been more chronic, either irradiation at high doses or short wave treatment, also in high doses, gives the best results. In general the various forms of physical therapy should be employed. — [Foreign Letters, J. A. M. A. **112**:1273 (April 1) 1939.]

Urticaria Provoked by Heat or Psychic Stimuli. J. G. Hopkins, B. M. Kesten and O. G. Hazel.

Arch. Dermat. & Syphil. **38**:681 (Nov.) 1938.

The designation "physical allergy" was applied by Duke to the symptoms of bronchial asthma, vasomotor rhinitis and conjunctivitis, photophobia, abdominal pain, erythema, pruritus, urticaria, angioneurotic edema, eczema and shock caused "specifically and solely by the action of a physical agent, such as light, heat, cold, mechanical irritation, freezing and burns and, in the case of heat sensitiveness, indirectly by mental and physical exertion." Perhaps the most familiar of these manifestations is urticaria excited by cold and heat, which Duke divided into three types: (1) general urticaria provoked by heat, physical exertion or emotional excitement, (2) local urticaria provoked by heat and (3) local urticaria provoked by cold.

The authors observed 15 patients in whom it seemed clear that generalized urticaria was brought on by exposure to heat. Fourteen were white and 1 Negro; 3 were male and 12 female. Their age at the time of onset varied from 12 to 31 years, only 2 patients being over 25. Taking hot baths, remaining in warm rooms, exposure to summer sun and standing in front of a fire or over a cookstove were the most frequent exciting causes. Two patients had had attacks after eating hot food. Twelve believed attacks were brought on by physical exertion, especially by athletic games, dancing and swimming. Twelve recognized that psychic stimuli which they described as excitement, anger or just nervousness brought on attacks.

The disease had persisted when the patient was last seen for from two months to fifteen years, and in only 2 cases have they observed cessation of attacks, after three and after six years, respectively. Three patients stated that their attacks were worse in summer, 3 that they were worse in winter and 2 that a change from cool to hot weather made them severe. The reaction of 2 patients to heat was studied by observing them in a warm cabinet at different temperatures. At 100 F., with about 50 per cent humidity, an outbreak occurred after an hour; at 120 to 140 F., in fifteen minutes. Whatever the surrounding temperature, the wheals appeared when the rectal temperature had risen from 0.14 to 1.2 degrees.

Placing of the lower parts of the legs in a tub of water at 110 to 112 F. proved a more regular and effective stimulus. On six such tests with the same 2 subjects a profuse eruption appeared in from twenty to forty minutes when the body temperature had increased from 0.6 to 1.5 degrees. Less severe stimuli are sometimes effective, and 1 patient reported that baths at 92 F. brought on attacks.